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THE AMERICAN GAS LIGHT JOURNAL

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Correspondence.—Wishing to make this JOURNAL a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of those subjects a pleasure or a profession.

Books.—We will forward by express, at publisher's lowest rates, any book—scientific or otherwise—to any address in the United States or Canada. We would suggest to our patrons that to avoid the risk and expense consequent on sending us the money (we do not send books C. O. D.), that orders for books be sent us through the Purchasing Department of the American Express Company.

The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[OFFICIAL NOTICE.]

Twenty-Second Annual Meeting, American Gas Light Association.

AMERICAN GAS LIGHT ASSOCIATION,
OFFICE OF SECRETARY, PROVIDENCE, R. I., Sept. 8, 1894.

Extract from the Constitution.

Sec. 12. Application for Active Membership, or for Associate Membership, or for transfer from Associate to Active Membership, must be received by the Secretary at least 10 days prior to the meeting at which the application is acted on.

GENERAL ANNOUNCEMENT.

The 22d annual meeting of the American Gas Light Association will be held at Washington, D. C., October 17, 18 and 19, 1894.

The meeting will be called to order by the President, W. H. Pearson, of Toronto, Canada, at 10 o'clock, A.M., on October 17, in Builders' Exchange Hall, on 13th street, between G and H streets. This is 3½ blocks from the headquarters, the Arlington Hotel, which is located on the corner of H street and Vermont avenue, one block from the White House. The Arlington is conveniently reached by the principal street car lines, as are the other first-class hotels in its vicinity.

As the most satisfactory quarters are always obtained by writing in advance to the hotel people, the following list of hotels is appended, and it is particularly suggested that in writing to them a reply be requested, for which a self-addressed and stamped envelope should be inclosed, as misunderstandings and disappointments may thereby be averted. Remember, "First come, first served."

Hotel.	Rate per Day.	Distance from Hall.	Remarks.
Arlington.....	$4 to $5	3½ blocks.	This is headquarters.
Riggs House....	$3 to $5	2 "	Located at 15th and G streets.
Willard's	$3.50 to $4.50	3½ "	Located at 14th street and Penn ave.
Ebbitt House...	$4	2½ "	Located at 14th and F streets.
Wormley's.....	$3	2½ "	Located at 15th and H streets.
Normandie.....	1 in room, $4.50 2 " 3.50 3 " 3.00	4 "	Located at 15th and I streets. Can take 100 persons.
Shoreham	$4	2½ "	Located at 15th and H streets. Can take 125 to 150.
Hamilton House	$2.50 up	4 "	Located at 14th and K streets.
National.....	$4	10 "	Located at Penna. av. and 6th st. Cars go within 3 blocks of hall.
Metropolitan....	$2.50	10 "	Penna. ave., close to National Hotel.
Howard House.	$2.50	10 "	Penna. ave., close to National Hotel.

All of the above hotels are conducted on the American plan, and can take from 25 to 50, except the Normandie and Shoreham (see "Remarks," above). The rates named by the Arlington, Riggs, Willard's and Normandie are special for this convention.

Reduced rates for transportation are being arranged for and undoubt-

edly will be secured. The final arrangements will be fully explained in a later circular of detailed information.

The roll call will be made by means of the door card method as usual, and be in charge of one of the Committee of Arrangements. Each member or visitor upon entering the hall for the first time will at the door receive a special card upon which to write his name, address, etc., the card then to be given to the doorkeeper.

The list of papers to be read at the meeting is not given herewith, as some of them are still in question, or titles not definitely settled; but the members are particularly requested to carefully read every page of the July and October "Quarterly," and come to the meeting prepared to discuss the articles therein presented, as the papers will be distributed in that form only. A complete list of the papers will be given later in the circular of detailed information.

Each member is expected to send in not only papers on original subjects, but also written discussions or analyses of any or all of the papers written by others, such written discussions to appear in the next issue of the "Quarterly."

The Question Box will be be made a special department of the "Quarterly," provided the members will support it by sending in responses to queries, as well as to keep the Box full of questions, which will be printed in each issue with the responses to the queries of the previous issue. Send in your questions as early as possible; *now*, if you can.

The Committee of Arrangements are completing the details of their programme, which will be reported later in another circular above referred to. The Secretary, however, is allowed to hint that the members will not be obliged to "kill time" for want of entertainment. The ladies will also be well cared for as usual.

Agreeably to the ancient custom of the Association, it is proposed to hold the traditional banquet on the evening of Thursday, Oct. 18, and in continuation of the precedent established last year, each one will pay for his own ticket. In order that the Committee may have some reliable data upon which to base their arrangements, will you please *immediately* fill out and mail the inclosed card to the Secretary, as this is very important, that the data therein asked for should be in his hands as soon as possible, *whether you expect to attend the meeting or not.* The Committee cannot complete their work without it.

During the days of the meeting bulletin boards will be placed in the lobbies of the Headquarters and the Meeting Hall. All members are warned to take due notice thereof and govern themselves accordingly, that they may be apprised of any change in or addition to the programme.

Many of the members have allowed their dues to remain yet unpaid, and this is a source of much difficulty to the Treasurer and extra work and worriment to the Secretary, who has already sent several statements to each of the delinquent ones, as you must know, if you are one of them, unless you have failed to notify him of change of address.

The present addresses of the following-named members are unknown to the Secretary, who will be glad to receive any information concerning them: Joseph L. Hallett, E. H. B. Twining, Ed. R. Conant, Robert N. Sumner, W. I Wilson.

Don't forget that postal card to return. A. B. Slater, Jr., Sec.

Extract from the Constitution.

51. No member who owes two years' dues shall be entitled to vote, or to participate in the deliberations of the Association, or to receive a copy of the Proceedings.

52. Any member whose dues shall remain unpaid for a term of three years may be dropped from the roll of membership by a vote of the Council.

BRIEFLY TOLD.

The Outlook for the Washington Meeting Once More.—We confidently expected that Secretary Slater's last official note of warning regarding the Twenty-second Annual Meeting of the American Association would have come to hand this week, but it is likely that the delay in issuing the same arose from his inability to complete in time certain minor details, which, although not of great importance themselves, nevertheless were necessary to the publication of a completed circular programme. As we suggested last week in our reference to the meeting, Mr. Slater has secured reduced transportation rates from the trunk lines, and his success in this respect has been so thorough that the same can be availed of by nearly all of the delegates and visitors, no matter from what district of the country such voyagers shall come. This was no small task, and we are sure that all will avail themselves of the opportunity to profit by his diplomacy. We are safe in saying that President Pearson will be greeted by a rousing attendance, since nearly every gas man who has visited 32 Pine street in the last fortnight—and it is needless to add that they were many in number and representative in character—has affirmed his intention of reporting at Washington in mid-October. A score or more of the delegates will travel in a special car on the 11:30 A.M. train, leaving New York from the foot of Liberty street, and we understand that another special from the East has been made up to travel by way of the Pennsylvania Railroad, per the celebrated Colonial Express. The entertainment programme provided for the amusement of the wives and daughters of the visitors during the time of the business sessions of the Association, and through the evenings, as well as on the final day of the convention, is very complete; and it also looks probable at this time of writing that many of the gentler sex will grace Washington with their presence during the days of the convention. Don't forget to secure your quarters in advance; and don't forget to have your applications for membership in Mr. Slater's hands within the time provided by Section 12 of the constitution.

The Prepayment Meter.—A good share of our issue for this week is devoted to considering the prepayment gas meter. In the first place we reprint Mr. Wimhurst's paper, read before the last meeting of the Eastern Counties Gas Managers Association, in which that gentleman details his experiences with the prepayment gas meter, in the small town of Sleaford, a place that probably does not shelter a population in excess of 4,000. Looking over Mr. Wimhurst's experience, we think he ought to be very well satisfied with its results, since with 200 prepayment meters at work, he figures that their placing has gained for his Company an addition to its output of something over 1½ millions cubic feet per annum—presuming, of course, that none of the prepayment meters were substituted for or took the place of meters of the usual sort. Looking at the figures on which he estimates this increase we are inclined to believe that he has underestimated rather than overestimated the gain, for he takes the actual output for July and August of 1894, and multiplies the sum by six. We presume it is very much in Sleaford as it is everywhere else—that is, that the gas output in the months named would not fairly represent the average monthly output for the year. Or, to put it in another way, that the users of prepayment meters would burn vastly more gas in December and January than they would burn in July and August; wherefore, if Mr. Wimhurst added 25 per cent. to the estimated 1½ millions cubic feet he would be nearer the actual mark for the consumption of the twelvemonth. If this way of reckoning is correct, he may fairly credit himself with a gain that is a very striking testimonial to the efficiency of the prepayment meter as a means of increasing the use of gas in small towns. He, however, with true British character, is inclined to growl at the cost of the meter, which growl, no doubt, is intensified by the unwillingness of the meter makers to guarantee the meter for a period of five years. Now, in the case of a gas maker in this country, whose business approximates to that carried on by Mr. Wimhurst's Company, perhaps the growling would be a trifle more excusable, for his prototype on this side of the water could not have for consolation the special privileges enjoyed by Mr. Wimhurst. For instance, the gas man here could not add an extra price to the gas sold by prepayment meters, either in the shape of so much per 1,000 in money, or in the guise of a meter rental. However, what interests us most is the fact that the Sleaford gas manager has made a success of the new instrument in a very small town, and it goes without saying that our gas men can do at least as well. There can be no doubt about it that the initial trial of the prepayment meter in this city, where quite a number of the devices have been in operation for some months, has met with a fair measure of success, despite the fact that the manufacture, the placing and the attending to of the same were all new to the makers, the gas companies and their employees. The second reference in a practical way to the prepayment meter in our current number is an illustrated description of the device patented by Mr. William N. Milsted, of the American Meter Company, a gentleman whose mechanical genius has often been practically and successfully shown in connection with the meter industry. No other man in the business is more fully aware of the difficulties connected with the development to perfection of the prepayment meter, and even a superficial examination of the specification proposed by him for the Patent Office, respecting his application for letters patent, shows wherein he believes a marked imperfection exists in the present day meters of this sort. The last reference to the subject will be found in our Special English Correspondence, wherein Mr. Humphrys admits that "the prepayment meter is not all perfection." Whether so or not, the fact remains that many thousands of meters of the type are in use in England to-day; and the general verdict is that they "have come to stay."

Notes.—Mr. Hugh Murphy has resigned the Superintendency of the Sing Sing (N. Y.) Gas Company, in the service of which he spent 26 years.——A fire occurred in the purifying room of the Citizens Gas and Electric Light Company, of White Plains, N. Y., some days ago, that at one time threatened to wreck the works.

Experience with the Prepayment Meter System.

[A paper read by Mr. H. Wimhurst before the Eastern Counties Gas Managers Association.]

I make no apology, as your Honorary Secretary, for reading this short paper, seeing that the members of this Association will not come forward with papers as readily as the Committee would wish at each of our general meetings. I have therefore consented to fill a gap by relating my experierience with the prepayment meter system.

After giving the system serious consideration, I advised my Directors, in May, 1893, and they consented, to adopt prepayment meters in cottage property; but as a precautionary measure I was to only order six as an experiment. These were fixed in June, and such was the demand, through an advertisement in the local papers and by circular, that during that month we fitted up 20 cottages with "coin" meters, fittings, and boiler burners. These 20 meters proved such a grand advertisement for the system that I was early inundated with orders, and was much delayed by being unable to procure the meters from the makers. However, as fast as we could get them they were fixed, until at the end of 1893 we had fitted into cottages 144, to which number we have since added, and now have 203 prepayment consumers. This number could have been increased to 300 had we not ceased fixing during the past three months, owing to the pressure of other and more important business.

In deciding to adopt the system, I intended to be very careful as to the class of fittings we should use in fitting up the cottages; and I was determined to put in a good article that would not cost much for repairs. I therefore decided upon supplying two lights—one in each of two rooms—a swing pendant ¾ inch by ½ inch, and a ½-inch single-joint bracket (both extra strong), fitted with a good 4-feet governor burner, also a good strong boiler burner, 3 feet of best rubber tube, and a stop-cock; each cottage being fitted throughout with compo. pipe, none less than ¾ inch diameter being used. The average cost of each cottage, including everything but the service pipe and main taps (which latter we provide free in all cases) was $13.87, or, exclusive of the meters, $4.06 per cottage.

So successful has gaseous fuel become with this class of consumers that many of them have had fitted up a cottage cooker, for which a rent of 25 cents per quarter is paid. As this cooker will not receive quite an equal treatment with those supplied to our larger and ordinary consumers, I have fixed the rent of them at a higher figure than usual, to cover the extra cost for repairs. We have supplied these cookers to about 17 per cent. of our prepayment consumers.

During the period from June, 1893, to June, 1894, these 203 meters have registered a consumption of 926,300 cubic feet, and have produced a revenue of $1,070. This sum has been apportioned as follows: Gas, $870; meter rental, $116.52; and fittings rental, $83. I may here say that our usual price is 93 cents per 1,000 cubic feet, subject to discounts of 5, 7½ and 10 per cent. according to consumption. But, the prepayment consumer having to pay, in his pennies, the meter and fittings rental charges, I fixed this at 20 cents per 1,000 feet extra (not any too little, in my judgment)—making his price $1.14 per 1,000 feet, or slightly over 18 feet for 2 cents.

I should have preferred to give this paper at a future date, but for the promise of a meager programme for to-day; hence the incomplete manner in which it is prepared. Had further time been at my command, I could have given—say, in twelve months' time—the exact average consumption by each consumer, and the profit made therefrom. But my experience leads me to say that we do get a very substantial sum from these, our latest friends—the "coin" meter consumers. When, however, you consider that these meters have been fixed spreading over a period of about eleven months, it is difficult to arrive at a perfect return. This, however, I do know, that, had we not adopted the system, we should not have had the supplying of over a million cubic feet of gas since its initiation, and the subsequent profit therefrom.

From a careful calculation, I find each consumer will use from 7,000 to 8,000 cubic feet of gas annually, which for every hundred will be (say) about 750,000 cubic feet, or for those we have now in use 2,525,000 feet. As I consider the extra 20 cents per 1,000 cubic feet we charge for this class of consumer covers the rental of meters and fittings, and also the extra cost of collection, if any, the profit will be that on the sale of a little over 1½ millions; in my case equal to a sum of $575, or (say) $282.50 for every hundred prepayment consumers. I find also each meter that has cost us $9.81 will average 79 cents per annum rent, or 8.07 per cent. of the cost; and the fittings in the cottages, at $4.06 each, will produce a rental of 45 cents, or 11.28 per cent. of the cost. (Since writing this paper, we have made another bi-monthly collection from 200 prepayment meters, with the following result, which fully bears out my estimate of the total annual consumption from this source: The 200 meters have registered a consumption of 256,200 feet for the months of July and August; or an average of 1,281 cubic feet per meter. If we multiply this by six, we get an annual consumption of 7,686 cubic feet per consumer. The sum collected during the time stated was $289.31, or $1,735.87 per annum, if we take the past two months as an average for the year; but my opinion is that it is under, rather than over, the mark. However, I think we may assume this last collection to be a fair average one, seeing we have not fixed any additional prepayment meters during the period of July and August. This being so, we shall get an increased annual consumption of 1,537,200 cubic feet from this source alone.)

These figures are, in the writer's opinion, very satisfactory, especially for a small town depending entirely upon agriculture for support; and they are such as will induce him to further develop the system, until every house and cottage within the limits of supply has been fitted up with gas as a fuel and lighting agent. Bearing in mind that in the town of Sleaford only about one-half of the houses are at present supplied with gas, there is a good field before us. It speaks volumes for the prepayment system when I state that, of the whole number we have fitted up, not one has been returned; but, on the other hand, all who have adopted the system are loud in their praises of it; and the writer thinks that what prevails in one town can readily be adopted in others, and similar success be met with.

I do not pretend to say that the system has been adopted without much trouble, for such has not been the case. On the contrary, much labor has been expended upon it, especially in its earlier stages. But I am happy to say we have brought it into as nearly perfect working order as possible. A great deal of trouble has been caused by imperfect workmanship in the meters. The makers have been so pushed for them that no doubt the parts were fitted up in many cases in a hurried manner; but I believe they are now quite alive to the defect named, and exercise every possible care. Even then, at times, mistakes do occur. Another and more troublesome matter with us has been the very free use of damaged and misshapen pennies that have been inserted in several cases—blocking the coin cylinder, and tending to damage the coin attachment. I think it may be an opportune time for all users of automatic machines to petition the authorities to call in all defaced bronze coins. If this can be done, much of the trouble with prepayment meters will disappear.

There is one matter I wish to mention in this paper, and that is the action of the makers of prepayment meters in reducing the period of guarantee from five years to one year. This, to my mind—and many others agree with me—is wrong, not only in principle, but against their own interest. The makers have succeeded in inducing gas companies and corporations to take up the system and get it into working order at no small cost, on the understanding that these meters would be guaranteed for the usual period; and when they find several meters come back to them for repairs, through no fault of the gas company or of the consumer, but on account of imperfect workmanship in the meters, the makers turn round and say: "We have not guaranteed these meters at all, and we shall only do it for one year." To say the least, this is sharp practice, and such as should be resisted. My experience leads me to say that the makers can readily give the usual five years' guarantee. The firms of whom we have bought know well that I have not returned more than 5 per cent. of the prepayment meters supplied to my Company. I am aware that during the last few weeks, since I have taken up this matter rather publicly, the makers have decided upon giving the usual guarantee for an extra payment of 2½ per cent. for the other four years. Their argument is that, at present prices, it will not pay, and that they have been losing money upon these meters from the commencement. My opinion is that the meter makers are quite capable of taking care of themselves; and when they fixed the original prices of the "coin" meters, I have no doubt they left a very fair margin of profit. At any rate, no gas engineer would wish to buy of them any article upon which they had not made any other than a fair profit; and my advice to the makers is this: Revise your prices, and give the usual guarantee of five years with every meter. I may here add the meters do not receive that rough treatment which the makers would lead one to believe.

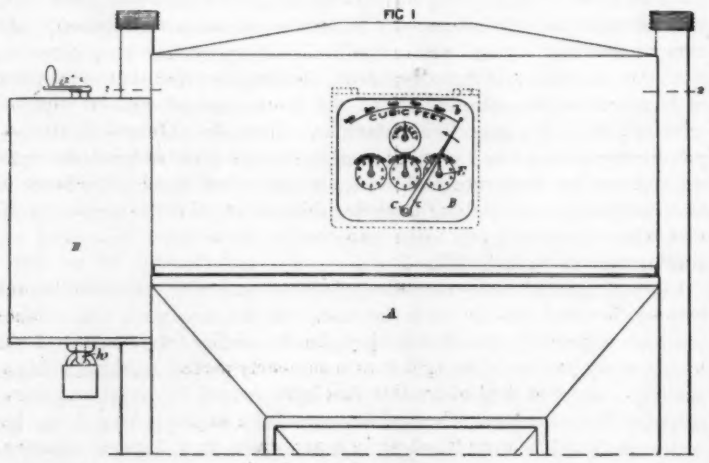
In conclusion, let me thank you, gentlemen, for your forbearance in listening to this rather meager paper. I trust it may lead to some debate, and then I shall be amply repaid for the little trouble I have taken (perhaps unwisely) in preparing this subject for discussion. I should like, as your Secretary, to add a request that each member may, in his turn, prepare a paper upon some useful subject for discussion, and thus

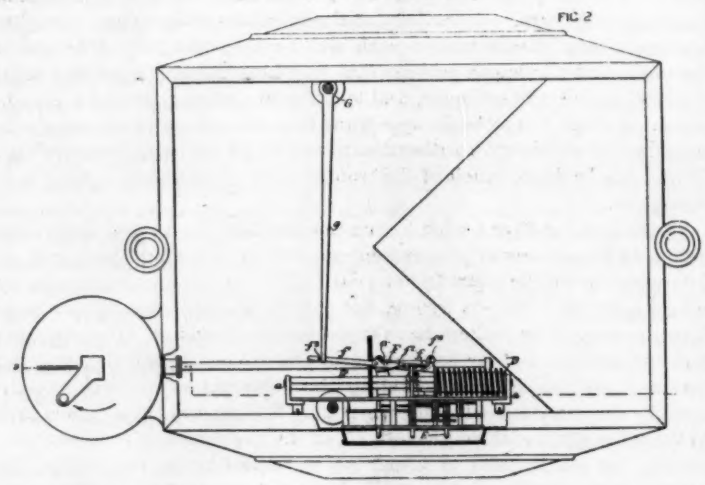
lighten somewhat the most irksome part of a Secretary's duty—asking gentlemen time after time to prepare and submit papers for discussion at our meetings.

Milsted's Prepayment Meter.

On September 18 U. S. Letters Patent (No. 526,251) were granted to Mr. William N. Milsted, of this city, for improvements in gas meters. Using the words of the specification :

My invention relates to certain improvements in gas meters in which automatic vending mechanism is used, so that a user of gas may purchase a certain amount of gas by simply placing a coin in a receiver, which is so connected to the meter as to allow a certain number of feet of gas to be used for a given amount. For instance, in the mechanism





which I shall proceed to describe, the apparatus is arranged to receive silver quarter dollars, and the apparatus is so connected to the meter mechanism that, for instance, if the gas is selling at $1.25 a thousand cubic feet, the mechanism would be so timed that upon the insertion of the quarter dollar, 200 feet of gas could be used before the mechanism of the meter would be stopped, and the meter shown in the drawings is so arranged that five quarters can be fed into the apparatus, so that $1.25 worth of gas, or 1,000 feet, can be paid for at one time. By this means a person can pay for gas in small installments, rather than wait until the sum accumulates, and more care will be taken in using gas.

In the accompanying drawings Fig. 1 is a front view of sufficient of a meter illustrating my invention. Fig. 2 is a sectional plan on the line 2—2, Fig. 1. Fig. 3 is a sectional elevation on the line 3—3, Fig. 2. Fig. 4 is a section on the line 4—4, Fig. 3. Figs. 5 and 6 are perspective views of details of the invention; and Figs. 7, 8 and 9 are views of modifications of portions of the apparatus.

A is the meter casing of the usual construction, having a dial plate *B* on which are the dials for the feet, indicating the measurement by thousands, tens of thousands, and by hundreds of thousands. I also provide an extra dial *b*, showing the number of cubic feet paid for and not used by the purchaser. The hand *c* on a shaft *C* indicates the number of feet not used.

While I have shown in the drawings the dial *b* as extending only to 1,000 feet, it may be differently arranged, and include more or ess than 1,000 feet. The shaft *C* has at its opposite end, within the meter casing, an arm C^1 bearing against a sliding worm *D* adapted to a squared or other polygonal sectioned or splined shaft D^1, mounted in bearings *a a* on the index plate. This worm gears with a pinion *e* on the shaft *E* of the indicator of the 1,000 feet dial, as shown in Fig. 1. The shaft D^1 is turned by a coin-controlled mechanism, so that when a quarter dollar is placed in position and the coin-controlled mechanism turned, it will turn the shaft D^1, and, as this shaft turns, the worm *D* will be fed forward, the pinion *e* acting as a fixed nut for the worm.

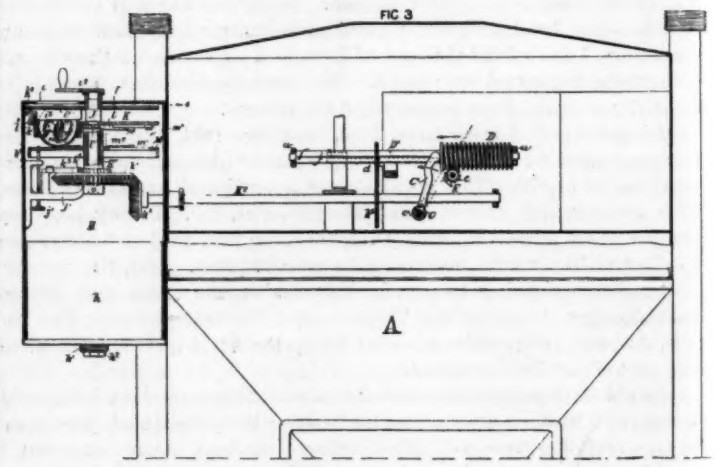
It will be understood that I may, by introducing suitable wheels between the shaft K^2 and the shaft D^1, turn the latter in the reverse direction when necessary, without departing from my invention.

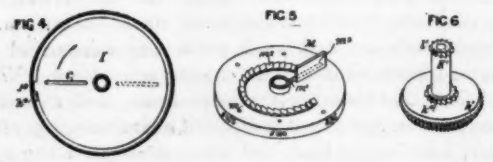
As the worm is fed forward on the shaft, in the direction of the arrow Fig. 3, it will also move the arm C^1 in the direction of the arrow, and this arm being adapted to the shaft *C*, will move the hand *c* in the direction of its arrow to the 200 point, and as the gas is used the shaft *E* of the indicator mechanism will move in the direction of the arrow and push the worm *D* on the shaft back to its normal position, and the arm C^1 on the shaft *C* will follow, as a spring c^1 tends to keep the arm always against the end of the worm *D*.

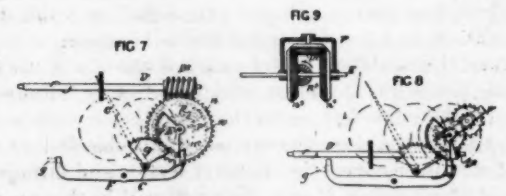
In order to arrest the operation of the meter when the worm has reached the limit of its rearward movement, I pivot an arm *F* on a bracket a^1 projecting from the index plate, and one end *f* of this arm has a tendency to fall in front of the worm *D*, a spring f^2 bearing against a pin on the arm, as shown in Fig. 2, while the other arm f^1 extends into the path of an arm *g* of the flag rod *G*, a lug f^3 on the arm f^1 checking the movement of the arm *g*, and consequently checking the movement of the flag rod, which carries one of the heads of the bellows of the meter. Thus the bellows cannot move their full distance, and the valve mechanism controlled by the flag rod cannot throw its full distance, and consequently the meter will stop measuring, and the supply of gas will be shut off.

A spring pawl f^4 pivoted to the arm *f* of the lever *F* will yield when the shaft D^1 is turned by the insertion of a coin, so that the arm *f* of the lever *F* will be pushed out by the worm *D*, and the arm f^1 of the lever moved clear of the arm *g* of the flag wire, allowing the meter to measure a certain quantity of gas.

The coin operating mechanism I prefer to use is clearly shown in Fig. 3, and consists of a box *H* secured to one side of the meter, and in







the bottom of this box is a money receptacle *h*, confined to the box by a bar h^1, which is pivoted at h^2, and through which passes the staple h^3, secured to the body of the box. A lock can be readily applied to this staple.

Other means of fastening the money receptacle within the box may be used without departing from my invention.

In the upper part of the box is a coin slot i, and directly under the top of the box is a disk I, having a coin slot i^1, and provided with a handle i^2, by which it is turned. This disk is mounted on a vertical stud J secured to a bracket J^1, which is attached to the side of the box H. When a coin is inserted in the slot in the disk I, the disk must be moved in the direction of the arrow to the discharge point to register, and then must be returned in the reverse direction. It cannot be turned a full turn in the direction indicated, as it will be stopped by a projection h^4 on the casing striking a projection i^4 on the disk.

Directly under the disk I is a disk K, having a coin slot k, which must align with the coin slot i^1 in the disk I, and with the coin slot i in the casing, before a coin can be inserted; and when a coin is inserted as shown in Fig. 3, the coin itself locks the disk I to the disk K, and they both travel forward together to the point of discharge, which in the present instance is in the opposite side of the casing, as shown by dotted lines in Fig. 4, and full lines in Fig. 3. This disk K is fixed to the hollow shaft K^1, to which is attached the bevel gear wheel k^1, which meshes with a bevel gear wheel k^2 on the shaft K^2 extending into the meter, and this shaft K^2 has a gear wheel k^3, which meshes with a wheel d on the shaft D^1, so that when the disk K is turned the shaft D^1 is also turned to an extent dependent upon the manner in which the disk is geared to the shaft, so that the worm will be fed forward the required distance.

The hub of the wheel k^1 has a ratchet k^4, to which is adapted a spring pawl k^5 pivoted to the frame J^1. This pawl prevents the wheel k^1 returning with the disk K. The disk K is connected to the hollow shaft K^1, through the pawl l carried by the disk, and ratchet l^1 carried by the shaft, so that while the shaft K^1 must travel forward with the disk K, it will be held from returning by the pawl k^5, and the pawl l on the disk will pass freely over its ratchet. The depending portion i^3 on the disk I, on its return movement, strikes against the projection l^2 on the disk K, so that the disk K will be returned with the disk I, and both will be stopped in proper position directly under the slot i in the case, by the stop h^4, as shown in Fig. 4.

M is a fixed plate mounted on the shaft K^1, and fixed in the casing by a pin j^1, tapped into the bracket J^1, and extending into one of the holes m in the plate, as shown in Fig. 5. The plate has a coin slot m^1 and a lug m^3, adapted to stop the rotation of the disk K, a lug on the disk coming in contact with the lug m^3, when the disks I and K are turned, so that their coin slots will align with the coin slot in the plate and the lug and coin carrier meet, the coin will be released from the disks I and K, and fall into the receptacle through the coin slot m^1. On the upper face of this plate M are ratchet teeth m^2, with which the lower edge of the coin engages, so that as it is fed forward, it passes over these ratchet teeth, but cannot return owing to the teeth, so that a user could not turn the apparatus backward and forward. The plate M can be adjusted by setting the pin j^1 in any one of the different holes, according to the price of gas. If the plate is now set for gas at $1.25 per 1,000 feet, the plate is turned so that the distance between the coin slot i and the coin slot m^1 will be greater, but if it is more than $1 per 1,000 feet, the plate will be moved so as to shorten the distance between the two coin slots.

On the edge of the plate M, as shown in Fig. 5, are a series of numbers, indicating the price of the gas at that point, and in the casing H is a sight hole h^5, closed with glass, or it may simply have a cover, or may be covered in any suitable manner. This will indicate to what point the plate M is set.

In Fig. 7 I have shown a modification of the mechanism within the meter, dispensing with the travelling worm or screw, and substituting therefor a fixed worm D^2 on the shaft D^1, which engages with a worm wheel n, having an internal gear n^1 engaging with a pinion p on an arm p^1 loose in the shaft E. This pinion in turn gears with a toothed wheel n^2 fast to the shaft E. The shaft C, carrying the hand c, is geared to the sleeve of the arm p^1 by segments $q\,q^1$, so that when the shaft D^1 is driven, the arm p^1 will be driven in one direction by the gears $n\,n^1$ and p, but when the meter is working, the arm p^1 is moved in the opposite direction through the gears n^2 and p, the teeth n^1 acting as a fixed rack.

The pivoted lever F is actuated by an independent segment attached to the arm p^1.

In Fig. 8 I have shown a modification of this gearing, in which the arm p^1 carries two gears secured together, one less in diameter than the other, and the larger gear meshing with a smaller gear on the shaft E, while the small gear meshes with a larger gear wheel which is driven by a worm D^2 on the shaft D^1.

In Fig. 9 I have shown the same arrangement, using bevel gears, the arm p^1 carrying the bevel gear wheel p^2, and this bevel gear wheel meshes with the wheels n^3 and n^4, the wheel n^3 being driven from the shaft D^1 through the bevel pinion n^5, and the bevel wheel n^4 being driven by the shaft E.

A Direct Reading Form of Platinum Thermometer.

By Mr. G. M. Clark.

During the last few years much progress has been made in the subject of thermometry. This is more especially the case in instruments whose action is based on a change in electrical properties, such as the electromotive force of a thermal junction, or the changes in resistance of a wire. It is to this latter class that the platinum thermometer belongs.

Whatever method of measuring temperatures is adopted, the assumption may be made that the change measured is proportional to the change in temperature. This assumption will give a scale of temperatures, depending, however, on the thermometric substance used, and which will not be the same when the thermometric substance is changed. In order to bring all such thermometric scales to a common basis, they have to be compared with the indications of the normal air thermometer.

In the case of a platinum thermometer, we make the assumption that the change in resistance is proportional to temperature, and call the temperature so deduced the platinum temperature. Thus if R_1 and R_0 are the resistances in steam at 760 millimeters pressure and ice, $R_1 - R_0$ 100 is the change in resistance per degree, and if R is the resistance at any other temperature, the platinum temperature $p\,t = (R - R_0) \div R_1 - R_0/100$.

The relation between the platinum temperature and the air thermometer scale has been experimentally shown to be expressed by the formula:

$$d = t - p\,t = \delta\left[\left(\frac{t}{100}\right)^2 - \left(\frac{t}{100}\right)\right]$$

where t is the air thermometer temperature, and δ is a coefficient whose value is approximately 1.50. This value of δ varies slightly from 1.47 to 1.63 with different samples of wire, but its value can always be determined by observations at three different temperatures. Hence it is always possible to reduce the temperature as given by any specimen of wire either to the air scale, or to that which would be given by some standard wire.

This latter is the scale which one is almost forced to adopt when dealing with extremes of temperature, for in the case of very low temperatures, *e.g.*, where air liquefies, the air thermometer is obviously no longer serviceable, and at very high temperatures, above 700° C., reliable experiments with the air thermometer have yet to be carried out.

The departure of the platinum scale from the air scale is not greater than the departure of the mercury scale from the air, so that those who are accustomed to accept mercury thermometer readings without hesitation will not have the order of accuracy of their observations reduced by accepting the platinum scale. In the construction of a direct reading instrument, it is obviously advantageous to have a scale divided into equal parts. The platinum scale has, therefore, been adopted in the direct reading thermometer of Callendar and Griffiths. This instrument is most easily described in two parts: (1) the thermometer itself; (2) the indicator.

In the thermometer, the platinum wire of .008 in. diameter is wound non-inductively on a mica former about 2 in. in length and $\frac{1}{8}$ in. in diameter. In order to eliminate changes in resistance in connecting leads, the stem of the thermometer contains four leads insulated by means of mica washers. Two of these are connected to the ends of the coil; the other pair, called compensators, are joined together just above the coil. The lower 12 ins. of these leads are of thick platinum wire; these and the coil are protected by a glazed porcelain tube. The choice of a suitable material on which to wind the coil, and the complete protection of the wire from furnace gases, are both points of considerable importance. Neglect of these precautions in the earlier forms of pyrometer fully accounts for the changes which they used to undergo. The upper portions of the leads are of copper, fixed to the platinum, and insulated by being threaded through pipe stem. They are protected externally by a steel tube, which may be extended to protect the porcelain tube in cases where the thermometer is liable to rough usage. The upper ends of the copper leads terminate in four binding screws to which the leads connecting the thermometer to the indicator are attached. These connecting leads may be of any length, so long as their resistance is not much greater than .5 ohm. The indications of the thermometer can thus be read at a distance from the place under observation.

The resistance of the platinum coil is adjusted so that the change in resistance for 100° C., from ice to steam, is 1 ohm, or, in other words, each degree is equivalent to an increase in resistance of .01 ohm. The platinum coil has therefore a resistance of 2.58 ohms at 0° C.

The measurements of resistance or temperature are made on the indi-

cator, which consists essentially of a Wheatstone's bridge and specially arranged galvanometer.

The two ratio arms of the bridge are made equal, and have a resistance of about 20 ohms. In the third arm of the bridge are 15 resistance coils each of 1 ohm, and the thermometer is introduced in series with these. The fourth arm is made up of the compensating leads and a coil whose resistance is such that the whole bridge is balanced when the thermometer is at 0° C.

The battery used consists of dry cells, giving about 2 volts at the terminals of the bridge, so that the current through the bridge is about $\frac{1}{10}$th of an ampere.

In the galvanometer, the moving portion consists of an astatic combination of steel magnets pivoted on a needle point, and to these a light aluminum needle is attached, swinging in a horizontal plane. The movement of the system is controlled by two sets of coils. These are arranged so that one pair is parallel to the pointer at the zero position of the scale, the other pair at right angles. The former pair are the equivalent of the ordinary galvanometer coils, the latter are in the direct battery circuit. Since the resistance of each arm of the bridge remains practically constant, the current which passes through the galvanometer coils will always bear the same proportion to the current in the battery circuit, whatever the electromotive force of the battery may be. The deflections of the galvanometer are, therefore, independent of the strength of the battery. The adjustment of the strength of the two sets of coils is made by means of a low resistance shunt across the field coils in the battery circuit. This is adjusted until the galvanometer swings across the scale for an increase of 1 ohm in the thermometer arm. The scale is divided into 50 parts, each representing $\frac{1}{50}$th of an ohm or 2°. As each of these divisions is about $\frac{1}{2}$ in., the scale can easily be read to 1°. For greater convenience the scale is repeated on the other side of the zero, so that the whole range of the scale without altering the resistance coils is 200°.

The resistance coils are all made of manganese wire, annealed and protected from air. There is thus no correction to be introduced for changes in temperature of the air. The instrument is also unaffected by changes in temperature of the leads to the platinum coil, for since these are in duplicate, and are placed in opposite arms of the bridge, any temperature change in one pair will be balanced by the same change in the other pair. The balance of the bridge is thus only affected by the temperature changes in the coil itself. When the platinum coil has been heated through 100°, it will have increased in resistance by 1 ohm, and the galvanometer pointer will be deflected across the scale. The resistance of this arm of the bridge can now be made the same as before by plugging in the 1-ohm coil, and the galvanometer returns to zero. The scale is then repeated every 100°, and thus a wide range of temperature and an open scale are obtained at the same time. The temperature is then directly read off, the hundreds of degrees by the coils plugged in, and the remainder on the scale.

A further advantage of this arrangement is that any error in the original adjustment of the swing, or want of astaticism in the system, does not produce any cumulative error. A truly graduated scale would not be one of equal parts, though it is not, as might appear at first sight, a tangent scale. The error introduced by the equal scale, however, is small, and the above remark about its non-cumulative effect applies to it also.

A very common objection to this form of pyrometer is the statement that its fixed points change after exposure to high temperatures. The only answer I can give to this objection is that, in the experience of those who have experimented with this form of pyrometer, its most distinguishing feature is the permanence of its fixed points. The objection is only urged by those who have no experience of the instrument, but is based on the report to the British Association in 1874, appointed to examine one particular form of instrument only. As an illustration of the permanence of the fixed points, I may give the following: One of these instruments was immersed in melted silver, the source of heat being an oxyhydrogen flame playing on the bottom of the crucible. This crucible, by some means, became broken, the silver poured out, and the oxyhydrogen flame was left playing directly on the lower end of the porcelain tube for some time before the accident was discovered. As a consequence, the lower end of the tube became fused. On subsequent examination it was found that the wire coil and mica had become imbedded in the porcelain, and it was impossible to remove the interior of the instrument. On trial in ice, however, the freezing point was found unaltered.

The porcelain tube may thus be considered as completely satisfactory in protecting the platinum coil. The difficulty of the protection of the stem is one which has not as yet been fully overcome. The difficulty is not insurmountable, as it might be met by extending the porcelain tube the whole length of the stem. Such tubes are, however, difficult to obtain, and if broken would be expensive to replace.

The second objection is the adoption of a new scale of temperature. As bearing on this point, I may quote from Callendar's paper on "The Practical Measurement of Temperature," 1886:

"We at present require a practical standard to which all measurements may be directly referred; the question of its exact relation to the absolute thermo-dynamic scale may be matter for subsequent investigation, and can best be solved when we have arrived at a more accurate and extended knowledge of the phenomena of heat, of the dependence of radiation, conduction, etc., on temperature measured in a scale, which may be to some extent arbitrary, but which will have the incalculable advantage of uniformity, so that the results of different experimentalists will be accurately comparable."

It must be borne in mind that if circumstances render it advisable to express the temperature on the air scale, the relation as given by the *d* formula has been established up to 700° C., and that there are indications that it holds over a far more extended range. One fact will, I think, show the accuracy of the above formula, which was determined by Callendar in his exhaustive comparison with the air thermometer in 1885. In 1890 Griffiths came to the conclusion that the relation apparently established by Callendar was in error at temperatures about 450° C. In assuming Regnault's value for the boiling point of sulphur, 448.3, the difference between this and air temperature, as deduced by Callendar's formula, from the platinum temperature, was found to be about 5°. It was evident that either Callendar's or Regnault's conclusions were incorrect. A re-determination of the boiling point of sulphur by direct measurements with the air thermometer was made in 1891, when it was found that the true boiling point of sulphur under a pressure of 760 millimeters was 444.5, a result in almost exact accordance with the temperature obtained by using platinum thermometers and the assumption of Callendar's formula. It is difficult to imagine a more conclusive proof.

Evidence that this relation between the platinum and air scales also holds at very low temperatures is not wanting. In a communication to the *Philosophical Magazine*, by Griffiths and myself, in 1892, we pointed out that if we assume that R becomes 0, and also assume that the d formula holds over such a range, the resulting temperature is in the immediate neighborhood of $-270°$ C. According to the experiments of Professors Dewar and Fleming, it is at this temperature that the resistance of pure platinum should vanish.

Although there is so much evidence that the d formula is correct throughout the whole range of the platinum thermometer, still it is never safe to extrapolate beyond the range of actual experiment. I would therefore suggest that all measurement of temperature be referred to a standard platinum thermometer, in which, say, $\delta = 1.50$. There is no necessity that such a thermometer should actually exist, as it is only a matter of calculation to reduce the observed platinum temperature to the standard.

The Fire Risks of Electricity.

[By "S. H. N.," in *Am. Exchange and Review.*]

The constantly increasing use of electricity for illumination of factories, stores, theaters and dwellings causes a very considerable addition to the general fire risk. Underwriters now require the placement of electric wires by strict and definite rules, yet in time or by accident a good installation may become disarranged (very little is enough to incite fire), and unexpected causes may make unsafe that which was declared safe and invulnerable by the best experts. Industrial establishments, of which we desire more especially to speak, may become liable to danger in this respect if using their own dynamos to excite electricity for power or illumination, or if renting an electric current of a certain strength brought into the buildings by wires from outside central stations. It will be noticed from what follows that parties renting or paying for the use of a current of electricity are exposed to more danger than those using their own dynamos.

The latter being usually in the basement along with the boilers and steam engines actuating them, and generally set on very firm bases, do not, in themselves, cause as much fire danger as the wires they serve. These, however safely installed, are liable to a number of casualties. If they be located where there is much tremor of floors from machinery in motion, such as looms, pickers, etc., the insulating covering may wear off in places, and a too strong current, which is always liable to be actuated in them, may heat them to a white heat, with almost instantaneous burning of certain portions where the highest circuit exists. Wate-

spilled on floors beneath which are fastened the wires on strips of dry wood, or on a wooden ceiling, may cause "short circuiting" while the current of electricity is in action, with ignition as result.

This would cause burning of the inflammable insulation material and its dropping in blazing particles upon light goods, such as cottons or materials like oiled wool or cleaned and opened cotton left incautiously under unprotected wires. We say unprotected, because shallow tin pans swung under the whole length of the wires would eliminate such danger where the most inflammable materials were located, and also in other portions of the works. This plan has the additional advantage of not covering the wires from view. It is curious that a slight fire in a cotton or woolen mill (not arising from electric wires) might be made worse by short circuiting of electric wires occasioned by water of extinguishment—through the burning thereby of the covering of wires and the falling of such burning particles on open cotton or wool.

Incandescent electric lamps are the kind generally used for interiors of industrial establishments as the safest; but if for any reason *arc* lamps be employed, unless the open lower part of the globe be protected by a metallic pan, sparks and pieces of ignited carbon may fall on inflammable goods below, or on paper spread over the floors, causing ignition. A notable instance of what was believed to be ignition by this mode was recorded in the *Review* in the occurrence of a fire which destroyed a large mill on Randolph street, in the northern part of Philadelphia, and caused the loss of several lives. Since then one of the requirements of underwriters has been the protection (without tight closing) of the lower opening of arc light globes. Proper regard for safety requires that no inflammable goods be allowed below either arc lamps or electric wires, whether protected or not.

The current supplying electric arc lamps is much stronger than that needed for incandescent electric lamps; and if by any accident an excess of current be thrown into the incandescent wires, they would probably do more damage than wires for arc lamps if similarly over-excited. Where the two kinds of lamps are used in one establishment, the utmost caution should be employed so that those for arc lamps may not by any possibility touch incandescent lamp wires or telephone wires. The danger in such case is considerable with those last mentioned.

One great jeopardy of a rented, low pressure current for incandescent lamps served by outside wires is, that a much more heavily charged wire for arc lamps or for power may sway against, in the street, or fall upon wires for incandescent lamps or telephone entering an industrial establishment—sending an abnormally high voltage into the wires within, causing perhaps incandescence of the weaker current wires and burning of their covering—especially where weak spots exist, but which places would otherwise have sustained intact the current force intended for them.

In same manner to a greater degree, though more rarely, wires outside during a heavy electric storm (in this case static or high tension electricity) may cause disaster to a building by instantly flashing over light or telephone wires within and igniting the wire covering, telephone cases, or materials in use, in manner already mentioned. Should electricity from a severe storm enter an industrial establishment having its own dynamos, through the outside telephone wires, a similar condition may occur, though there is perhaps less danger of or from such accident than where both kinds of wires are located outside. It should be noticed that in such cases the injury is effected by the static electricity through the wires conducting it to weak or dangerous spots.

When from any cause burning particles of wire covering fall upon the floors of factories littered with paper, oiled wool or cotton, the establishment may be entirely destroyed through the suddenness of the attack and its being so widespread in a number of stories at once. Many telephone wires and their cases in factories, and large switchboards in central stations, have been ignited by static electricity sent instantly in a vast current into the buildings by lightning through telephone wires - in some instances causing very disastrous fires—such as one which some years ago destroyed the large central station of the Western Union Telegraph Company, in New York City.

One of the modes whereby over-excited electric lamp wires may become dangerous is when they run perpendicularly on wooden strips on walls of factories where wool, cotton or waste is used or stored. Should the insulating covering of such wires become in any way ignited, the stock which might be carelessly piled against or near them or their wooden casing could easily become ignited. Wooden casing to prevent injury to wires and short circuiting has some advantage, but it should not be forgotten that such dry wood under certain circumstances can itself become ignited from the overheated wires. Covering with wood or by running wires through pipes has the great disadvantage that injury may arise in the wires and there be great difficulty to locate it.

The thick copper wires which convey a strong electric current from central stations to the dynamos under "trolley" electric cars, now become so numerous in American cities and towns, may by crossing and touching electric light or telephone wires send excessive electrification into industrial establishments and other buildings with results as already indicated. In such case the effects might be worse than that from an arc light wire, because the electric current is far stronger in such overhead trolley wires—it being also maintained thus in nearly equable degree by supplemental charges from subterranean wires at intervals of several blocks, or less, to restore the energy to the main wire as it is expended by use on the car.

It will be useful to compare the jeopardy of gas and electric illumination. It should be observed that with the latter, especially for cotton, woolen and shoddy mills, the dangerous necessity is avoided of carrying, often twice per day, an open or closed light to start illumination by gas. Many factories have been burned from this cause. It is true that all the gas lights of a room may be lighted at once by electric wires served by jar cells, but such arrangement is far from being prevalent in factories lighted by gas. There is also the liability of combustible material or very light fabrics being blown by a draught into a gas flame. Such a condition with an arc light is not probable on account of the large surrounding globe, and is almost impossible with an incandescent electric lamp. Some most serious fires have been occasioned by gas flames touching light fabrics or cotton slivers; but it has previously been shown in the *Review*, *àpropos* of the Temple Theater fire, Philadelphia, that it is difficult to ignite a very light fabric by the incandescent lamp in action unless wrapped around the bulb for a considerable time.

The slipping of belts actuating dynamos in industrial establishments or at central stations may occasion damage to some wires by the dynamos being re-started at excessive speed, forcing momentarily too great a current through light wires, and the moment may be time enough to produce mischief; electricity is the most active of all workers. To avoid inconvenience, if not from fear of danger, high speed (1,000 to 1,200 revolutions per minute) steam engines are now frequently used to drive the armature of dynamo fastened on the main shaft of engine. This plan may have its advantages, but we think they are counterbalanced by the high speed being liable to cause heating of the main shaft and boxes, which may become a source of expense and loss, if not of fire danger.

We remember having seen some years since a large Corliss steam engine, of which nearly all the Babbitt metal of the large front pedestal box for main shaft was *melted* and had run down on the foundation, through the carelessness of the engineer, who did not preserve the oil cups and their outlets clean and in good order. This applies also to the general shafting throughout factories, and to shafts and boxes on and under cotton and woolen carding machines. Were stationary engine engineers and others always careful, this illustration would be superfluous; and in general it may be said that electric lighting by both modes and power from electric stations are all admirable, while probably more than three-fourths of the fire risk they occasion is preventable, and would not occur if employees would use the care and attention that is properly due to engines for this purpose and to electric wires.

Having spoken of the liability of excessive electric current to invade wires of buildings, it should also be stated that in no instance should an installation of electric wires be made without there being placed on, or very near, the wall where the wires enter from without, a metallic cut-off of soft metal several inches long, which would bear the normal current needed, but would fuse and break the connection should excess of current invade the wires.

There ought also to be care observed about the use of "converters" of alternating to continuous currents, or *vice versa*, which may serve a large number of lights in certain departments—for we have noticed such apparatus which constantly produced a loud humming and so much heat that one could not bear the hand upon the outer metallic casing. This production of heat is not remarkable when an alternating current of electricity moving at the rate of 50 to 200 vibrations per second is suddenly changed to a continuous current.

From the foregoing remarks it is evident that electric currents from central stations to industrial establishments for illumination and power, besides the use of dynamos in factories, are at present liable to certain kinds of jeopardy; but these will not necessarily increase with the greater use of electricity in all its forms. It is, therefore, very needful to keep properly in view the fire risks pertaining thereto—since, with new arrangements, such jeopardy must vary considerably, and, as already intimated, may diminish in ratio instead of increasing. We shall be glad in the future to note diminution of fire danger in the use of electricity for all purposes.

Facts About Gas Radiators.

Messrs. George M. Clark & Company, in forwarding us their new catalogue for the coming winter season, furnish us the following hints respecting their gas radiators:

The time was when people were satisfied with a gas heating stove made from a piece of gas pipe with holes drilled in it at the bottom of a section of 9-inch stove pipe. Like every other household article, improvements had to be made to suit the present standard. In recognition of the demand for a radiator constructed on sanitary principles and giving the greatest amount of heat with the least expenditure of gas, we have brought out this year the Jewel Radiators. The following brief description is intended to call attention only to the most prominent features. Note carefully the illustrations.

The Burner.—The atmospheric burner is a hollow cored casting, slotted throughout its length, so constructed that the flame from end to end is perfectly even and intensely hot.

Inner Flues.—There are just as many inner flues as outer flues. The inner flue is supported at the bottom by the cast iron elbow described below, as will be seen from the sectional view.

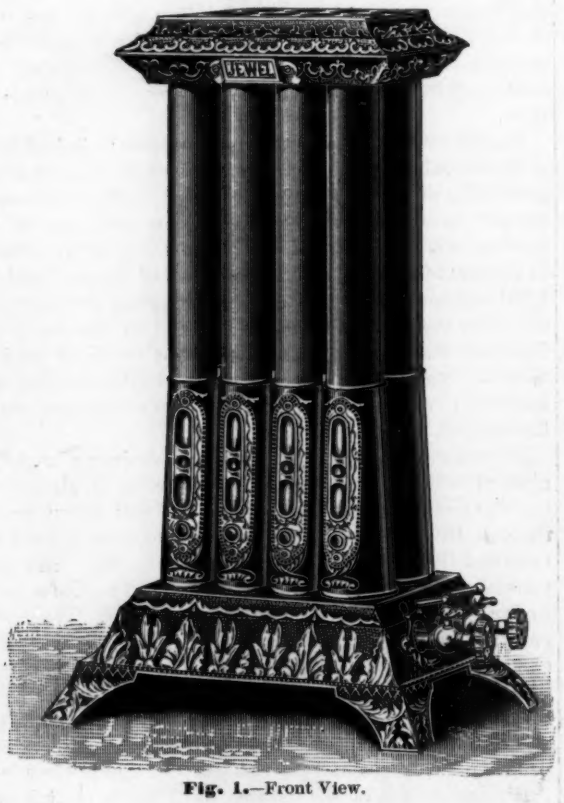


Fig. 1.—Front View.

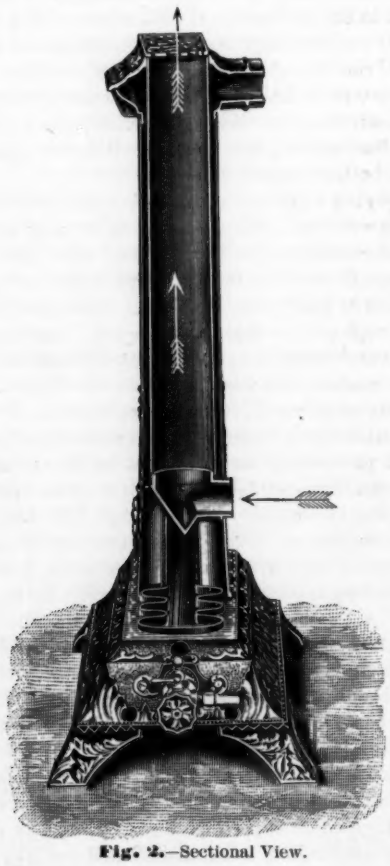


Fig. 2.—Sectional View.

Outer Flues.—The outer flues, for 12 inches from the base casting, are made of cast iron, the better to radiate the heat, and at the same time for durability. The perishable parts of all gas radiators are the flues. Above the cast iron part, the sheet iron part is heavily enameled inside and out, which is very durable, and cannot burn or rust.

Circulation.—Fresh air from the back of the radiator enters the cast iron elbow about 5 inches above the flame. The air so brought in does not come in contact with the flame, but through this casting, almost red hot, is discharged directly into the room. The space about the inner flues is purposely small, and around the inner flues, and upward and outward to the outlet for a chimney connection, flows the hot air containing the products of combustion. The narrowness of the space checks the flow of hot air, and so by radiation its heat is diffused.

Healthfulness.—Almost everybody knows (and anyone, if they will stop to think, will understand) that the discharge of the products of combustion into the room is unhealthful. If anyone using a Jewel gas radiator wishes to connect this with a chimney, every particle of carbonic acid gas will be carried off. This is not necessary for the successful operation of the radiator, but is strongly urged by us. The further, too, that such waste heat is carried through a small flue pipe, the more the heat is obtained by radiation in the room.

Finish.—In this respect the Jewel radiators are ahead of anything in the market. They are made in three styles of finish—white, gold and blue enamel throughout, enamel and nickel, and enamel with the castings neatly stove-blacked.

Illuminating Flame.—For those who prefer, we make radiators with an illuminating flame, which is bright and cheerful and nearly as hot. The construction of these is otherwise the same as the atmospheric flame radiators.

Rapid Method of Ascertaining the Degree of Fluidity of Lubricating Oils at Various Temperatures.

Mr. F. W. Daw, in describing an instrument which determines in a rapid way the degree of fluidity of lubricating oils at various temperatures, says:

Mineral oils, either alone or mixed with fatty oils, are now very generally used for all kinds of lubrication. The oils vary greatly in fluidity, from the almost solid hydrocarbon, such as vaseline, to the thin fractions of petroleum, such as kerosene, and it becomes very necessary in selecting these oils for specific kinds of economic lubrication that the fluidity is suitable at the temperature and pressure of working; the mere look of the oils at the ordinary temperature is no criterion of what the fluidity would be at the working temperature of the bearings.

In most large engineering establishments, such as the works of the railway companies, oils are brought by tender, and samples are sent with the quotations. Before any tender is accepted, the oils are examined by the company's chemists as to quality and physical condition. The great length of time necessary to conduct an exhaustive examination of several oils often renders the analysis of little use when, as is often the case, oils are wanted quickly, and contracts are made before the various tests are completed. The writer has been experimenting with a new form of instrument, the "Fluidimeter," recently invented by Mr. H. Joshua Phillips, F.I.C., F.C.S., by which the fluidity or viscosity of several oils at a time can be very quickly determined. The perfected fluidimeter consists of a copper bath 14 in. long, 9 in. wide and about 1½ in. deep, and at the top end there are two holes, one for a thermometer and another for pouring in water or other liquid to be maintained at definite temperatures by a small flame under the bath. The surface of the bath contains six cups connected to the bottom by gutters, all of definite capacity. (The instrument can be made with one cup and gutter, or any number.) The cups hold 1½ c.c., are 1 in. wide and $\frac{3}{16}$th inch deep, and the gutters are $\frac{1}{16}$th inch wide and $\frac{1}{16}$th inch deep, and are graduated from about 1 in. from the cups in ⅛ in. to 10 in. near the

bottom of the plate. There is a glass plate provided for covering the bath to keep away air currents, and there is a receptacle at the bottom of the bath for receiving the oils as they flow down, and also a tap for letting out the liquid from the bath when required. A protractor of 6 in. radius and divided into single degrees is fixed to the side of the instrument, by means of which the bath can be tilted to any desired angle. The surface of the bath is silver plated, and the whole swings upon elevated bearings from two studs fixed in the sides regulated by thumbscrews. The method of testing is as follows:

Water or oil having been run into the bath at any desired temperature, a small Bunsen flame is placed under the bath, regulated so as to maintain it at the same temperature. The oils to be tested are poured into test tubes provided with pipettes, and heated in a bath of water or oil until the desired temperature is attained. The bath is now tilted at an angle of 2½° from the horizontal, from the operator, and the oils run into the cups until they reach the zero mark on the scale, about an inch from the cups. The glass plate, previously warmed to about the same temperature as the oils, is now slid on, and the bath tilted at any desired angle to the operator, and the time noted that the oils take to reach the 10 in. mark. I find that the time of flow of the oils is practically inversely proportional to the angle of inclination, provided the angle is sufficiently great, or the temperature sufficiently high, to allow the oils to run quick enough to minimize errors due to oxidation or cooling of the oil by air currents. This seeming deviation from the laws of gravitation is, of course, due to the decrease of acceleration consequent upon the loss of "head" and gradual loss in weight of the oil as it flows to the terminus. For instance, the following results were obtained with pure rape oil at a temperature of 180° F.:

Angle.	Distance.	Time in Secs.
2½°	10 inches.	33
5°	"	16
10°	"	8

A sample of mineral engine oil gave:

		100° F.	140° F.	180° F.
2½°	10 inches	160	60	28
5°	"	79	30	14

From these results it would appear that the time of flow could be calculated for any desired angle from one determination at a definite angle. The following results were obtained in comparing the viscosity of pure rape oil at different temperatures with Redwood's viscosimeter, assuming the rate of flow to be 1 at 180° F.:

At	Phillips's Fluidimeter.	Redwood's Viscosimeter.
180° F	1.00	1.00
140° F	1.59	1.56
100° F	3.19	3.14
60° F	7.50	7.37

The great advantage the writer has found in using the instrument is that in cases where several oils have to be examined and to be compared with a standard, a great saving of time is effected, inasmuch as all oils that do not approach the standard in fluidity can be discarded, and an exhaustive examination made only of the oils that agree in fluidity with the standard.

The sole makers of the instrument are Messrs. Townson & Mercer, of 89 Bishopsgate street, London, E.C.

Most Economical Temperature for Steam Engine Cylinders.

Mr. Bryan Donkin, in a paper on the subject named in the heading, read before the British Association, said that to diminish condensation his experiments prove that it is essential to reduce the difference of temperature between the incoming steam and the cylinder walls. In most cases the cylinder walls are much colder than the steam, and often one-half the weight of steam is condensed during admission. Many experiments show that the nearer the temperature of the cylinder wall is to that of the entering steam the greater is the economy. With walls 40° to 60° F. colder than the steam, as is often the case, the consumption is greatly increased, owing to the large amount of condensation. On the other hand, the cylinder metal can be made too hot and heat wasted at exhaust. This has also been experimentally proved by the author. The best results in steam economy have been obtained when the temperature of the internal surfaces is a little higher than that of the entering steam. Cylinder walls can be heated in various ways. The most usual is to raise their temperature and that of the covers, by means of boiler steam introduced into the jacket spaces. Another method, and one used a good deal on the Continent, is to work with superheated steam. This steam has been employed in some cases with advantage in the jackets as well as in the cylinders. Smoke jackets have generally proved a failure. When the jacket is connected to a condenser having a good vacuum, economy of steam is also obtained, but not so much as with steam in the jackets. To secure the maximum economy also, it is important not only to diminish the volume of the clearance spaces, but especially to reduce as much as possible the area of the clearance boundary surfaces. In this way the weight of iron heated and cooled per stroke so many degrees can be materially diminished. The character of the internal surfaces, whether rough from the sand or turned, and their position, horizontal or vertical, have also some influence on the transmission of heat and condensation of steam, as verified by recent trials. Experiments have also shown that the cylinder wall in any working steam engine is divided thermally into two parts; the outer portion remains at a constant temperature, and the inner or periodic portion is heated with each steam and cooled with each exhaust stroke. The relative proportion of these two parts, or the depth to which the heat penetrates into the metal, depends largely upon the speed of the engine and on the temperature of the cylinder relatively to that of the entering steam. In the non-jacketed engine, with 1-inch cylinder walls, working at 35 revolutions per minute, the depth to which the heat penetrates and fluctuates per stroke is at least about 8 to 9 mm. from the internal surface. The depth of heat penetration for the same speed is much less with hot than with cold walls; a less weight of metal is heated per stroke, and condensation is found to be much reduced.

The author gives some of the results of 80 experiments on a small vertical engine, with cylinder 6 inches diameter and 8-inch stroke, made expressly for experimental research. The engine was worked with very different temperatures of walls, and many tests were made, condensing and non-condensing, jacketed and non-jacketed, single and double acting at different expansions, and with both saturated and superheated steam in the cylinder and jackets. Care was taken in these experiments only to vary one set of conditions at a time. Results of two experiments are added, one with hot and the other with cold walls, or one with steam and the other with air in the jackets. Both tests were made condensing, double acting, with 50 pounds steam pressure, $\frac{3}{16}$ cut off, and at a speed of 220 revolutions per minute. The walls were some 30° F. hotter with than without steam in the jackets; the steam consumption per indicated horse power hour was reduced from 41¼ pounds to 28½ pounds, or about 31 per cent.; the thermal efficiency was increased from 5.7 to 8.1 per cent., or 40 per cent.; and the rate of initial condensation was reduced from 400 pounds to 217 pounds per square foot per hour, or by more than one-half. The percentage of steam present in the mixture during expansion was also increased by about 50 per cent. Throughout these experiments an increase of economy with the hotter walls was always verified; the thermal efficiency was higher, the initial condensation less, and the percentage of steam present during expansion always increased.

The tests on this engine point to the practical conclusion that the range of steam temperature in the cylinder per stroke has much less effect on the steam consumption than the temperature of the walls. The results may be shortly summarized thus: The most uneconomical results were always obtained with the cylinder walls colder than the entering steam. Under these conditions considerable initial condensation was produced, drops of all sizes up to 3 mm. diameter being formed and running down the cold surfaces. The heat also penetrated into the colder walls to a considerable depth, a certain quantity being given up by the steam at every stroke, to raise the temperature of the internal surfaces after exposure to the condenser temperature. Both at cut off and release there was a great deal of water in the cylinder compared with the weight of steam present. On the other hand, the most economical results were always obtained from the cylinder walls which were at about the same temperature as that of the entering steam. Under these conditions the rate of initial condensation was very much lower, and the drops of water formed much smaller in size. The heat penetration into the walls was also much less, a smaller amount of steam sufficing to heat the internal surfaces after being cooled by the condenser. The percentage of steam present in the mixture at cut off and release was also very much increased. If engineers and others using steam engines wish to work economically and with smaller boilers, they must arrange to keep their boilers and covers as hot as the steam entering the cylinder, otherwise the cylinder becomes unintentionally an efficient condenser with a large area of cooling surface. Properly applied steam jackets are economical, because they raise the temperature of the walls touched by the steam. Those who cannot steam jacket the whole cylinder should at least jacket the two covers, which are the most important surfaces. Well arranged jackets with properly sized pipes for entering steam and exit water, without places for air to collect, are an excellent investment, and pay a good interest on the small additional cost.

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, Sept. 10, 1894.

Water Gas at Belfast—Street Lighting—A New Use for Gas—Prepayment Meters.

A report recently presented to his Committee, by Mr. J. Stelfox, engineer of the Belfast gas works, furnishes by far the strongest case in favor of water gas that has yet been advanced in the United Kingdom, and it is scarcely too much to say that its publication will mark the beginning of a new era in regard to this system. He commences by reminding his readers that the set of carbureted water gas plant, which was put down last year, was intended to assist in meeting the increasing demand for gas at a time when they found it difficult to obtain the additional land which was necessary before they could proceed with extensions in the usual way. It was hoped that it would enable them to produce more gas on the same area of ground, and also to relieve their stock of coke. But the results of nine months' experience in actual working went further than confirming these anticipations, and showed that gas could be produced not only readily but cheaply. They had expected that the oil would cost 3½d. per gallon, but had really been able to obtain it at 2½d., and were now in a position to purchase for two years ahead at 2d. So the effect of the cheap supply of oil was to render the manufacture of water gas less costly than that of coal gas. He therefore, suggested an extension of water gas plant. An existing retort house was capable of producing 2,700,000 cubic feet of coal gas per day, and although this could be increased by adopting regenerative furnaces and the most recent improvements, there were various reasons why this could not be done. The cost of reconstructing one-third of the plant in the house would be £9,000, and the production would be 900,000 cubic feet per day. But for about double that cost, a water gas plant could be placed on the same site, capable of producing some 3½ million cubic feet per day. So we have it on Mr. Stelfox's authority, after nearly a year's actual working, that the first cost of water gas plant is only about one-fourth that of coal gas plant, that the space required is in about the same proportion, and further, that with oil at 2½d. per gallon the working expenses are less than those of coal gas. In connection with the latter consideration a great deal turns upon the price of oil, and Belfast, as an important seaport town, is certainly favorably situated for unloading direct from tank steamers. But after allowing for this, the price is remarkably low. The "gallon" mentioned is an English gallon of 273¾ cubic inches, and if the figure named is a fair representation of the regular and permanent price of suitable oils, the matter is worthy the careful consideration of all who are working in seaboard towns at any rate, especially as it may safely be taken for granted that any alteration in the price of coal will not be in favor of the buyer.

The publication of a treatise, written in the complete and exhaustive style that is a feature of French technical literature, dealing with the subject of the street lighting of Paris, has naturally attracted attention to the fact that the arrangements adopted for lighting the streets in London and our principal towns are not such as to leave nothing more to be desired. A certain noble lord once found fault with the fit of his garments, and told his tailor that he would cease to deal with him. To this the man of cloth replied that it was not the fault of the coats and trousers so much as that of the figure inside them. In a similar manner it may happen that other causes besides the actual lighting arrangements have contributed towards securing for Paris the title of the best lighted city in the world. But after allowing for all this, it must be admitted that there is no town in England where an endeavor is made to deal with the public lighting as a complete whole. In one or two particular cases some attempt has been made in the way of carrying out a respectable "installation" of street lighting by the use of columns and lanterns specially designed to harmonize with the surroundings, but these are few and far between. The bulk of the appliances used for lighting our streets and public spaces are of a cheap and plain description, and when one reads of the care that is taken in Paris, not only to secure elegant designs in the first place, but in the way of painting, cleaning and keeping in repair, he naturally wonders how it is that English ratepayers are satisfied with some half dozen stock patterns of posts, neither of which can claim any special skill or taste of design, and one regulation shape of lantern of which the only point to be urged in its favor is that of cheapness. Sometimes the repainting is delayed until bare iron begins to show in several places, and no attempt is made in the way of periodically washing off the dust and mud that accumulate on the posts. The street lamp post is certainly a prominent object, but as a matter of fact, nobody cares what its appearance is like, except perhaps the select few who devote the greater part of their time to grumbling in general. It is nobody's business to see that the lamps in our streets are artistic or in correct proportion. Our neighbors across the Channel like beauty and elegance, and do not object to pay for it. But we in England are indifferent so far as our daily surroundings are concerned, though not averse to an extravagant expenditure in the particular instances referred to, just to show that we could do it if we liked.

Yet another use for gas has been suggested, and a gruesome one it is. Some one has observed that cremation is too costly, being at present a luxury only accessible to the wealthy, and turns to the adoption of gas as a fuel in the crematorium as a means of placing such an enjoyment within the reach of all. He also speaks of furnaces, "more or less portable," which seems to suggest the possibility of having cremation at our own homes. One of the earliest engineers, who successfully engaged on a large scale in the business of making iron castings, was buried in a coffin of that material, which had been prepared in readiness some years previously. Possibly the originator of this suggestion is at present securing the means of existence through the highly respectable agency of coal gas, and influenced by the same kind of feeling as that which animated the iron king, experiences a kind of "melancholy satisfaction" in looking upon it as a means of expediting the process of natural decay that must, in the course of events, sooner or later overtake his earthly tabernacle. It is needless to add that the ease with which gas can be controlled renders it quite as adaptable for this as well as for more cheerful purposes. A special feature of the cremation system is the retaining of the ashes. Some time since the body of a celebrated personage in Wales was cremated, and in order to secure the remains intact it was previously inclosed in an iron box; but the fire was urged too fiercely, with the result that the iron was melted, and the ashes of the dear departed were mixed with those from the coal and rendered unrecognizable. Such a catastrophe as this would not have occurred if gas had been used as a fuel.

We have heard a great deal about the prepayment meter lately. In the first place it has been largely introduced in the districts of those undertakings that are noted for occupying a front position in the march of progress. It should be remembered that this plan includes not only the "penny-in-the-slot" device, but also the plan of supplying fittings free, and putting an extra charge on the gas to include profit and depreciation. The user of gas incurs no expense beyond the penny inserted from time to time. In one or two instances short collection systems have been tried, involving either weekly or monthly payments. I believe Mr. Valon, of Ramsgate, has tried the inclusive price. But with the exception of these and a few other isolated cases, neither the small payment nor the inclusive price have been tried in other ways. So it is scarcely possible to say how far the automatic delivery plan is concerned in the success. It is well known that the first cost of fittings has been a great drawback, the holders of weekly tenancies, in particular, having a great objection to expending money upon fixtures. The same class, as a rule, receive their wages weekly, and prefer to pay for household necessaries as they require them, rather than to run quarterly bills. So there are at least three factors concerned in the demand for prepayment meters. The South Metropolitan alone have fixed 20,000 of them, and they have not only been adopted in our large but in our small towns.

But, like everything else, the prepayment meter is not all perfection. Experiences with them appear to differ, for while some speak highly in their favor, others complain of trouble experienced with them. There are several different makes in the market, and it may be that one kind is efficient in working while another possesses characteristic defects. But of late a great deal of dissatisfaction has been created about a proposal made by the manufacturers to reduce the period of guarantee. The custom with regard to ordinary meters is to guarantee them for five years, but the proposition is that prepayment meters shall not be guaranteed for more than one year. It is scarcely necessary to say that other considerations besides cheapness are regarded in the purchase of meters, whether of the ordinary or of the special kind, and the suggestion does not find favor with gas engineers. The Eastern Counties Association of Gas Managers have issued a circular to the other Associations, suggesting that the matter is worthy of discussion, and possibly of further action. It was considered at a recent meeting of the Irish Association, in accordance with this suggestion, and a resolution in favor of the usual five years' guarantee was agreed to. The only other autumn Association meeting that has yet been held is that of the Eastern Counties. On that occasion Mr. Wimhurst, the Honorary Secretary, introduced the subject by reading a paper giving an account of his experiences with prepayment meters, and after a full discussion, he was

able to claim a general consensus of opinion in favor of the five years' guarantee. The reasons advanced in support of the proposal are various. Some say that the prices of the meters have been fixed too low, and that the additional guarantee cannot be given unless the price is raised about 10 per cent. Others say that practical experience shows a greater degree of risk of damage owing to the rougher usage to which the machine is subjected. But whatever the cause, the proposal is regarded with great dissatisfaction, as almost amounting to a breach of faith. Possibly the meter makers have followed the plan that has been adopted in at least one notable instance, of introducing their specialty at less than cost, in the first place, in order to get it well on the market. If this supposition is correct, many have been misled, for, of course, in entering upon a new scheme of this sort, the chief factor is the terms upon which the appliances can be obtained. As to the plea of rougher usage, it is evident that the insertion of the coin and movement of the lever must be attended with some degree of shock to the internal parts, but this is a matter that could not have been overlooked in the first place. Moreover, the suggestion cannot be regarded as helpful to the further sale of prepayment meters, as it implies some want of confidence in their accuracy and reliability.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE Directors of the Keene (N. H.) Gas Light Company have awarded the contract for their new electric lighting station at Sprague ville to the Berlin Iron Bridge Company, of East Berlin, Conn. The buildings are to be completed by November 15th.

THE Economy Gas Stove Company, of Decatur, Ills., has been incorporated by Messrs. G. Heidel, H. L. Mathews, A. Mathews and J. C. Hostetter. It is capitalized in $5,000.

A CORRESPONDENT at Halifax, N. S., forwards the following: "The arbitration that has been going on for some time for the purpose of ascertaining the value of the properties and franchises of the Moncton (N. B.) Gas and Water Company, which are to be taken over by the city, came to a close some days ago, so far as the arguments were concerned, when Attorney Blair made the closing speech on behalf of the Company. The case has attracted much attention, quite a notable array of legal talent having been interested by each side. The Act incorporating the Moncton Gas and Water Company was passed in 1877, and the works were put in operation in 1878, when a 10-year contract for supplying water and light was made with the town of Moncton, and also one with the inter-Colonial authorities. This contract expired in 1888, and the city of Moncton declined to renew it for another term, and obtained legislation for the purpose of taking over the plant and franchises of the Company at a valuation to be fixed by arbitrators, in case the city and the Company could not agree. The authorities offered $150,000 for the water supply plant and franchises, and an additional $30,000 for the gas and electric light properties, or a total for all of $180,000. As the Company was receiving a net revenue of $23,000 from the plants, it may be taken for granted that the offer was declined, and the question of compensation was referred to a board of arbitrators. The contention on the part of the city is that it should only pay an amount equal to that for which the plants could be put in operation today, while the owners of the Company demand a valuation on the basis of 4 per cent. earning power. Thus it will be seen that the Company looks for an award not far from $600,000."

THE holder of the Elyria (O.) Gas and Water Company narrowly escaped destruction because of a fire that broke out in the machine shops of the Weller Manufacturing Company.

THE history of the adjourned hearing before the Board of Gas and Electric Light Commissioners (the history of the first session of the hearing will be found in the JOURNAL for September 24) on the petition of the Brookline Gas Company for the right to increase its capital stock, was about as follows: Mr. L. L. Scaife, counsel for the remonstrant, insisted that the Board should make a thorough examination of the Company's affairs, and he contended that the Company had not made a case which would be sufficient to lead the Board to grant any increase of stock. Mr. Burrage (of counsel for the Company) replied that while there was nothing on the books of the Brookline Gas Company which it was unwilling to disclose, there was, however, no reason why it should produce its books in order to permit some stockholder to offer an objection. Commissioner Barker interjected the remark that the Legislature had invested the Board with inquisitorial power, and that the books would be examined should such a course be deemed necessary. Mr. Scaife replied that the stockholders had not a fair chance to present their case unless they were permitted to see the books. "That vote of the Company," he said, "is not merely to increase the capital stock $1,000,000, but it is sought to increase it from $1,000,000 to $2,000,000. The Board should decide what was requisite to carry out the Company's purpose. The vote of the Company was to increase the funds, to increase the capital stock and pay off the debts of the Company. The counsel ignores the first without authority, and asserts that the increase of capital is for the sole purpose of paying the Company's debts. The Company voted the $1,000,000 increase for a purpose, but its counsel pays no attention to this fact. Why not look at the Company's assets and see if it cannot pay the debts without increasing the capital stock? We don't suppose the Company has money enough to pay its debts, but this should be taken into account. The Company's condition and prosperity are to be taken into consideration; the interest of the public is to be considered; the Board should carry its investigations down to date." Mr. Burrage here said that the only further piece of evidence which he had to put in was the Treasurer's sworn statement, which affirmed that the last public sale of stock was May 27, 1893, when 1,000 shares were sold at auction, at par. Mr. Scaife at this point waxed rather warm, for he blurted out his belief that the Company's money had been wasted, and that charges had been made to capital which should have been charged to expense. Chairman Barker, prior to declaring the hearing adjourned to the afternoon of October 4th, stated that the Legislature evidently expected the Board to consider the public interests and make an examination of the Company's books, which would undoubtedly be done.

AFTER many adjournments the suit of the Montclair Gas and Water Company, of Bloomfield, N. J., against Boicanno & Marino, a firm of contractors building the Bloomfield outlet sewer through that town, was tried some days ago in the First District Court. The suit was brought for loss of gas and breakage of service pipes, belonging to the plaintiffs, while the defendants were constructing the outlet sewer on Bloomfield avenue, near the Baptist Church, such loss and breakage occurring from April 24 to June 28 last. Mr. Cosgrove, the Superintendent of the Montclair Gas and Water Company, testified he had often warned the contractors of the negligent manner in which they were carrying on their work, they frequently failing to shore the trenches; and proved that their oversight in this last respect had caused the break in the Company's pipe passing the church. The defense submitted by Mr. Marino was so weak (it virtually amounted to a confirmation of the testimony submitted by Supt. Cosgrove) that Justice Truesdell awarded damages to plaintiffs in the sum of $192.

AT the annual meeting of the Lewiston (Me.) Gas Company the officers chosen were: Directors, W. H. White, Seth M. Carter, E. C. Lee, S. T. Bodine and Randall Morgan; Treasurer, F. C. Wing; Clerk, W. R. Stevens.

LAST week we briefly noted the death of Mr. Van Leer Eastland, Superintendent of the Oakland (Cal.) Gas Light and Heat Company, and since that mention we have received some further particulars respecting deceased, the main points of same being as follows: "Mr. Eastland's death was shockingly sudden, in that the end came while he was walking on Mission street, near Tenth, San Francisco. He was a native of Tennessee, but had resided in Oakland for something over 20 years, and was in the 60th year of his age. He was identified with the Oakland Gas Light and Heat Company for many years and served it most acceptably. He was prominent in the Masonic and other fraternal organizations of Oakland, and was also a member of St. John's Episcopal Church. He leaves a widow and two children. His brother, Mr. Joseph G. Eastland, was one of the incorporators of the Oakland Gas Company, in 1866, in connection with Anthony Chabot, Jas. Freeborn and ex-Governor H. H. Haight."

WE understand that the Council of Excelsior Springs, Mo., has granted a 20-year franchise to local people for the establishment there of a gas company. The right is to be exclusive for the period named. This place is a post village and summer resort in Clay county, Mo., and is 33 miles by rail east-northeast of Kansas City. It is quite a busy place, and probably contains a permanent population of 3,500.

THE proprietor of the Ukiah (Cal.) gas works, which concern has been out of operation for some time, is considering the advisability of going on again. We ought, perhaps, to have said at the outset that the proprietor's name is J. S. Reed.

THE Los Angeles (Cal.) Gas and Electric Manufacturing Company has been incorporated to manufacture gas and electric fixtures. The Meyberg brothers are the leading spirits in the enterprise.

THE Natural Gas Company, of Muncie, Ind., has notified the consumers that a "revision" of the gas rates is about to be made. It is needless to add, we presume, that the "revision" is in the ascending scale.

THE Bay City (Mich.) Gas Company has been notified by the City Council that its franchise has expired, wherefore, unless an application is speedily made for a new and official lease of life, steps will be taken to oblige it "to cease using the streets and alleys for the purpose of carrying on its business."

THE Palatka (Fla.) Council has granted a franchise for the placing in that town of an electric lighting works.

MR. W. W. THAYER has leased the gas works at River Falls, Wis., and will hereafter operate the same. The former proprietors announced some time ago that, owing to poor business, the plant would be shut down on September 15th; but Mr. Thayer is confident he can make a "go" of it. He thinks success will follow a more liberal management, and there are many gas consumers of River Falls who agree with him.

AT a meeting of the Board of Directors of the Consumers Gas Company, of Woodbury, N. J., held on the 24th inst., it was decided to reduce the gas rate to $1.50 per 1,000 cubic feet, and it was also determined to enlarge the plant.

THE Gas Light and Coke Company, of New Albany, Ind., has filed suit against the city for damages in the sum of $2,500, alleging unlawful seizure of a lot, across which the city laid a sewer.

AT a meeting of the Boston (Mass.) Board of Aldermen, the following resolution was introduced by Mr. Norris: "*Ordered*, That a joint special committee, to consist of five members of the Common Council, with such as the Board of Aldermen may join be appointed to consider the subject of compensation for the use of the highways by street railways, electric light and gas companies and telephone and telegraph companies, and report on the same before the end of the present municipal year." In speaking to the resolution Mr. Norris said: "The subject of compensation for the use of streets by companies receiving franchises from the city was extensively considered by the Mayor, in 1891, in conjunction with the committee on legislative matters and use of streets, and the then Corporation Counsel delivered an exhaustive opinion on the subject. The proposition that companies should pay a percentage of net profits seemed to be the only one not objected to. For some unknown reason no definite action was taken, and it seems to me the subject is of sufficient importance to warrant the passage of the order and the consideration of the city government this year. Prior to 1891 the cost of constructing all highways in the city of Boston was paid out of the general tax levy, so that the cost of all highways was all borne by the citizens generally. This was an equitable plan, as all highways were for the use of the public, but according to the Acts of 1891, chapter 323, the cost of constructing must be paid by the abutters on said highway—a special tax for the construction of a highway that, when completed, must be given up for public use. Whether this special tax on the citizen for the construction of a special highway upon which he owns property is in accordance with the Constitution, 'proportional and reasonable,' upon all inhabitants, etc., it is useless to argue, now that the law has been passed, but it is fair and reasonable to presume that if the Legislature can authorize the city to compel its citizens to pay a special assessment for the construction of a particular highway upon which they may own property, in addition to the direct property tax, they certainly can exact compensation from any corporation which may receive a franchise to use said highway for the exercise of its business." The order was ratified.

THE works of the Standard Gas and Electric Light Company, of Huntington, L. I., are in operation, and the residents claim to be very well satisfied over the quality of the gas supplied them.

THE City Council, of Falls City, Neb., recently determined to close down the electric lighting plant, which has been operated by the public authorities. This determination resulted from the report of a special committee appointed to examine the condition of the plant. The report having been to the effect that the system was in need of extensive repairs.

THE stockholders of the Citizen's Gas Light Company, of Newark, N. J., in consonance with the plan for its consolidation with the Newark Gas Light Company, which plan was outlined in the JOURNAL some months ago, have surrendered their stock to the Directors, as Trustees, for the purpose of facilitating the agreement. We understand the name of the consolidated enterprise is to be the Consolidated Gas Company, and that while the active management will rest with those most prominent in the Citizen's Company, the President-Engineer (Mr. Vanderpool) of the Newark Company will be very much in evidence as a Trustee.

PROF. WILLIAM E. GEYER was recently retained by the Lighting Committee of the Newark (N. J.) Board of Street and Water Commissions to make a test of the candle power of the arc lamps furnished the city by the local electric light companies, which lamps are guaranteed to yield a light of 2,000 candle power, "nominal." The Professor in his report said he had made tests of 12 lamps, and that the candle values of the same were: Maximum, 1,570; minimum, 600; average, 890.

THE manufacturers of Wabash City, Ind., who have been using natural gas for fuel are declaiming loudly against the Wabash Natural Gas Company, which announced some days ago that it would hereafter decline to supply gas fuel to factories, except by measurement through meter, and then only at an advance of 50 per cent. in the rates heretofore charged. The new schedule takes effect to-day, and it stipulates that the charge shall be 7½ cents per 1,000 cubic feet, which taken all around is equivalent to an advance of 50 per cent.

THE Boston Gas Consumers Association has been organized, the named incorporators being Messrs. D. L. Randolph, J. D. Whitney, Carter P. Pomeroy, Isaac Hecht, J. R. Spring, Sampson Tams and Henry Krebs, Jr. The capital stock is $100,000.

MR. P. M. SAYLOR, Superintendent of the Defiance (Ohio) Light and Railway Company, is reported as authority for the statement that the company proposes to construct a water gas plant at once. The location of the works will also be changed.

THE following, from a recent issue of a Montreal newspaper is given for what it is worth: "The gas deal by which the Montreal and Consumers Gas Companies are to become one is as good as accomplished. * * * Negotiations for the buying out of the Consumers Company were as good as completed some days ago. Two lawyers, one representing each company, were chosen to arrange terms, etc., satisfactory to both companies. This has now been done. The Consumers Company, it is proposed, is to receive $400,000 for its plant, privileges, etc. This sum is to be payable in Montreal Company's stock at par, which at present prices will mean about $720,000. This is a good thing for the Aldermen's friends who were wise enough to take stock in the new company. These same people have been buying the stock of the old company during the last few days on tips received from Aldermanic quarters. When the old company goes before the City Council and asks for a renewal of its contract, it is promised it will have no difficulty in getting everything it asks and wants. This is all arranged already. Of course, the price of gas, which has been reduced to 95 cents per 1,000, will probably be put up again to the old figure. It is some two years since Messrs. Coates & King arrived in Montreal and purchased from the St. Henri Light and Power Company its charter, or rather that portion of it relating to supplying gas in the municipalities of St. Henri and St. Cunigonde. Unknown to the Montreal Gas Company there was a clause in the charter which permitted its owners to lay gas pipes in Montreal. * * * The Consumers Company, which was formed by Messrs. Coates & King for the purpose of taking up the obligations of the St. Henri Company, secured exclusive franchises for the supply of gas in the two parishes named, and also succeeded in getting a 15 years' contract from the city, this contract to come into effect next year, when the city's contract with the old company will expire. The works of the new company are pretty far advanced, but according to a legal decision it cannot supply gas in Montreal proper before May 1, 1895.

MESSRS. WHYTE and Cane have made application to the New Jersey courts for an order involving some of the acts of those connected with the the Equity Gas Light Company, of Brooklyn, N. Y. The petition also involves a reviewing of the business transactions of the Equity Gas Works Construction Company, which concern erected the plant.

THERE is trouble ahead for the Milwaukee Gas Light Company, in the shape of a suit instituted by Col. A. G. Weissert, who refuses to pay the meter rent demanded by the Company, in the instance of consumers whose monthly use of gas does not reach a certain money value.

INCANDESCENT electric lighting makes very slow progress on the Pacific Coast, and several of the companies engaged in such supply, particularly in small cities and towns, are in very bad financial condition.

THE Board of Trustees, of Vallejo, Cal., have authorized an increase in the number of public gas lamps from 36 to 62. The price paid is $3.25 per lamp per month.

THE Board of Supervisors of San Francisco recently directed the Chief of the Fire Department to see to it that all wires "used to conduct electric current for the purpose of producing electric light or motive power, run or suspended or stretched or kept or maintained over or across or upon the top or roof of any building in the city," were removed.

ERIE, Pa., through its Select Councilmen, has negatived the proposition to issue bonds in the sum of $125,000, the proceeds of such issue to be devoted to the construction of an electric lighting plant, to be maintained by the municipality.

THE Rockville (Conn.) Gas and Electric Light Company has issued $100,000 in bonds.

MR. GEO. L. TERRASSE has been appointed Business Manager of the Van Denbergh Laboratory of Chemical Industry, Buffalo, N. Y. The autumn calendar published by the Van Denbergh Laboratory carries a very handsome illustration of the Niagara Falls works of the Cataract Construction Company.

A Gas Manager's Experiences in Japan.

[By Mr. William Newbigging, in the *Gas World*.]

In April, 1887, I received the appointment of Engineer and Manager of the Tokio Gas Company, Japan, from Professor Watson Smith, then Lecturer on Chemical Technology at the Victoria University, Manchester, now of London University College, to whom the Company had intrusted the selection of a suitable man.

I need not enter into a description of the voyage, except to say that I sailed from Marseilles on one of the Messageries Maritime Company's steamers, and the passage out occupied 42 days.

On arriving at my destination I was, naturally anxious to see the place where I had to spend the next few years of my life. The site of the gas works is on the shores of Tokio Bay, and at the entrance of the River Sumidagawa, on which the city of Tokio, the capital of the Empire of Japan, is situated. The city covers an immense area, and has a population variously estimated at from 1½ to 2 millions. It is distant about 18 miles from Yokohoma, the port and settlement set apart for the use of foreigners, and is connected with it by a railway, with a double line of rails and an excellent train service. During the first few weeks I made a careful examination of the existing gas works and the district of supply, and then reported at length on the course which I thought it advisable the Company should pursue. Just about that time, however, arrangements had been made to introduce the electric light; and it needed greater power of persuasion than I possessed to induce the Company to carry out, in its entirety, the scheme I had in view.

The gas works, originally designed and built by a French engineer, as everything about the place testified, was too small to meet the demand for gas. In carrying out the requisite extensions I had the assistance of three young Japanese engineers, one from the Imperial University, and the others from a technical school; and willing and capable men I found them—intelligent, and pleasant to work with. We prepared detail drawings of the whole of the work, ordering the greater portion of the apparatus from England. Whilst this was being made and shipped, we were busy getting in the foundations and preparing the necessary buildings.

It was understood before I left England that I should have a couple of English mechanics to assist in the erection of the works, but my Directors came to the conclusion that the whole must be erected with native labor, saying that though it would take a longer time, still they would profit in many ways by the experience gained. Accordingly, the whole of the work was completed by native labor. And with the experience I had there, and subsequently with Brazilian and Portuguese workmen in Brazil, I can strongly recommend the gas manager going abroad to dispense with taking out or sending for English workmen except when absolutely necessary. I have invariably found the natives, both foremen and workmen, faithful and trustworthy, and capable of doing anything about a gas works.

It will be well to mention here that the undertaking was purely Japanese, no foreign capital at all being invested in it. The gas, which was sold at about $2.75 when I first went out there, was gradually reduced to about $1.50 per thousand cubic feet. But as regards the financial position of the undertaking generally I was kept in a state of blissful ignorance, my duties being confined to the manufacturing and distributing departments. Monthly meetings of the directors and half-yearly meetings of the shareholders, to which I was invited, were held regularly. The reports were read by the Secretary, there was an explanatory speech by the Chairman, and the usual votes of thanks closed the meeting in the orthodox Western fashion. The books were all kept in Japanese, the carbonizing book alone being in duplicate, one in Japanese and one English for my benefit. The metric system of weights and measures was adopted generally some years ago, and it only requires a few weeks' experience of this method of reckoning to make one feel the decided advantage that it has over our own.

Any suggestions that I made for increasing the consumption of gas were taken up and acted on. An exhibition of various kinds of incandescent, regenerative and ordinary lamps was held, and those interested were invited. Also, illustrated pamphlets, translated into Japanese, and setting forth the advantages to be derived from the use of gas, were issued. We distributed ordinary burners amongst the consumers, free of charge, in order to induce them to discontinue the old iron burners, which had probably been in use since the original gas works were started. We were also very moderate in our charges for putting in new services or cleaning out old services and fittings, and were always ready to give advice as to the best kind of fittings to adopt; and we placed every facility in the way of a consumer getting what he required. A meter testing apparatus, simple in character and easily understood by any ordinary person, was fixed at the works, and any consumer expressing doubt as to the correct registration of his meter was told that for a small sum—just sufficient to cover the cost of disconnecting and refixing it—we would take the meter out and test it. If we found it incorrect we did not charge anything. In this way we gradually won the confidence of our consumers, and in a very short time we began to feel the benefit of a conciliatory policy—until the new works were completed and started we could not cope with the increasing demand for gas.

The first thing I turned my attention to on formally taking charge was to see that I had a stock of coal, and, secondly, a stock of fireclay materials. The coal used in the works is Japanese; no foreign coal at all being required. The coal comes in junks, holding about 100 or 150 tons, and is discharged in baskets, by coolies, directly into the coal store alongside the wharf. We usually kept about two months' stock, as deliveries are somewhat uncertain. A manager requires to guard against spontaneous combustion, and this is usually done by inserting vertical iron pipes at intervals in different parts of the stack. If the coal is very "brassy," and liable to spontaneous firing, it pays to pick out the pieces by hand. But, if possible, this should be done at the pit head.

As regards fireclay materials, before ordering from England, I tried various kinds of native firebricks, generally by placing them in the furnace underneath the retorts and watching the effect. With two exceptions, they were not up to the mark. These two we decided to use in the bench and setting, sending to England for fireclay and for the firebricks required in immediate proximity to the furnace. This is rather an important item of expense, when one remembers that English firebricks cost over 6 cents each, delivered at the works. We also made an attempt to build a retort at a neighboring fireclay works, and though we succeeded in doing this, and setting it in an oven, the expense incurred made it much more costly than getting it from Europe.

Ordinary settings, containing seven retorts to a setting, were built; the house, which had been a coal store, not being adapted to any other. Had I again the designing of a retort bench abroad, I should construct the retorts of tiles. Though the first cost would be greater, the saving in breakages in transit, and in wear and tear, would more than compensate for the outlay.

Both coke and tar commanded a fair price in the market, and as no particular economy could be effected by using one in preference to the other for furnace purposes, we used coke, being the least troublesome.

To those thinking of adopting steel or wrought iron ascension pipes in preference to the cast iron pipes, I say, "Don't." My experience is that they perish immediately above the socket on the mouthpiece after they have been in use a short time only.

(To be Concluded.)

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

MONDAY, OCTOBER 1, 1894.

The Market for Gas Securities.

Consolidated was weak and lower, selling down to 119 yesterday (Thursday) on transactions amounting to 760 shares on the Exchange. The opening to-day was at higher figures, the bid price being 121, with offerings at 123. The weakness of the general market for what is termed the "industrial group" is undoubtedly the main reason for the decline. Other city shares are dull and strong, which latter qualification applies especially to Standard, its business showing a material increase over that of last year. The surprise for the week is the exceptionally strong feeling existing in respect of Brooklyn shares, all of which show remarkable gains, the latter in Municipal amounting to no less than 25 points. If this means anything, it means that consolidation is virtually settled. Chicago gas is notably weak, having sold before noon to-day at 68¼. We can assign no especial reason for this, and think the stock is a purchase. Bay State is weaker, at 23 bid, and Baltimore Consolidated shows no change. We have not heard much about New York and East River since time of last writing, but have a well-defined idea that it is "somewhat easier."

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks.

16 Wall St., New York City.

October 1.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share. ☜

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	121	123
Central	500,000	50	103	—
" Scrip	220,000	—	100	—
Equitable	4,000,000	100	170	175
" Bonds	1,000,000	—	106	108
Metropolitan, Bonds	658,000	—	108	112
Mutual	3,500,000	100	145	—
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	80	95
" Bonds	150,000	—	—	100
Richmond Co., S. I.	348,659	50	50	—
" Bonds	100,000	—	—	—
Standard Gas Co—				
Common Stock	5,000,000	100	27	35
Preferred	5,000,000	100	79	82
Yonkers		50	112	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	112	115
Citizens	1,200,000	20	50	—
" S. F. Bonds	320,000	1000	—	101
Equity Gas Light Co.	2,000,000	100	—	—
Bonds	1,000,000	—	—	—
Fulton Municipal	3,000,000	100	—	156
" Bonds	300,000		103	—
Peoples	1,000,000	10	75	—
" Bonds (7's)	368,000	—	100	—
" " (6's)	94,000	—	98	100
Metropolitan	870,000	100	150	—
" Bonds (5's)	70,000	—	—	155
Nassau	1,000,000	25	170	—
" Ctfs	700,000	1000	99	100
Williamsburgh	1,000,000	50	170	—
" Bonds	1,000,000	—	107	110
Out of Town Gas Companies.				
Bay State Gas Co.—				
Stock	5,000,000	50	23	23½
Income Bonds	2,000,000	1000	34½	35
Boston United Gas Co.—				
1st Series S.F. Trust	7,000,000	1000	80	83
2d " " "	3,000,000	1000	59	—
Buffalo Mutual, N. Y.	750,000	100	120	—
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	160	—
Chicago Gas Company.	25,000,000	100	68¼	68⅜
Chicago Gas Light. & Coke Co.—				
G't'd Gold Bonds	7,650,000	1000	81⅛	81½
Consumers Gas Light Co., Jersey City	2,000,000	100	56	60
Bonds	600,000	1000	92	—
Cincinnati G. & C. Co.	7,000,000	100	192	—
Consumers Toronto	1,600,000	50	184½	187
Central, S. F., Cal.			9	100
Capital, Sacramento, Cal			—	55
Consolidated, Balt.	11,000,000	100	—	67⅜
" Bonds	6,400,000		107	107½
Citizens Gas Lt. Co., Rochester, N. Y.	500,000	—	85	101
Bonds	250,000		—	—
Detroit Gas Co.—				
Con. Bonds	.....	.....	—	50
East River Gas Co., Long Island City	1,000,000	100	20	22
Preferred	.....	.....	36	38
Bonds	500,000	100	81	82
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1000	—	101
Hartford, Conn	750,000	25	120	128
Jersey City	750,000	20	190	200
Louisville, Ky	2,570,000	50	125	130
Laclede Gas Light Co. St. Louis, Mo.—				
Common Stock	7,500,000	100	18¾	19
Preferred "	2,500,000	100	72	74
Bonds	9,034,400	1000	88¼	88⅜
Little Falls N. Y.	50,000	100	—	100
" Bonds	25,000	—	100	103
Montreal, Canada	2,000,000	100	200	208
New Haven, Conn		25	200	—
Oakland, Cal.			42⅜	43
People's Gas and Coke Co., Chicago—				
1st Mortgage	2,100,000	1000	—	108
2d "	2,500,000	1000	104	105
Peoples, Jersey City	500,000	—	175	185
" " Bonds			—	—
Paterson, N. J.		25	99	102
Rochester, N. Y.		50	80	85
Preferred			90	95
Bonds			90	95
Syracuse, N. Y.	500,000	25	—	—
San Francisco Gas Co. San Francisco, Cal.	10,000,000	100	71	71½
Washington, D. C.	2,000,000	20	240	—
Wilmington, Del.	500,000	50	188	190

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DIVIDEND NOTICE.

STANDARD GAS LIGHT CO. OF THE CITY OF NEW YORK, 71 BROADWAY, NEW YORK, Sept. 14, 1894.

The Board of Directors have this day declared a dividend of one (1) per cent. on the preferred stock of this Company, payable on October 10, 1894, to stockholders of record at 3 o'clock P.M., October 1, 1894.

Transfer books will be closed from 3 o'clock P.M., October 1, to 10 o'clock A.M., October 11, 1894.

1002-2 FERDINAND McKEIGE, Secretary.

Position Wanted

As Superintendent of a Gas Works or Gas and Electric Plant Combined.

At present in charge of gas and electric plant with output of 12,000,000. Active pushing young man, with 10 years' experience. Good reasons for making a change, and can give good references from past and present employers. Address

10.8-2 "SUPERINTENDENT," care this Journal.

POSITION WANTED

As Superintendent of Gas Works.

Twelve years' experience. Main layer and gas fitter by trade Wants permanent situation, and will go on trial. References, National Gas and Water Co., 218 La Salle street, Chicago; Menominee Gas Light Co., Menominee, Mich., and others. Address

W. E. BELLMER, care Menominee Gas Co.,
1002-1 Menominee Mich.

Engagement Desired

As Superintendent of Gas Works

By a Mechanical Engineer of many years' experience in the manufacture and distribution of gas. Good references.

1008-1. Address "B.," care this Journal.

SUPERINTENDENT WANTED

By a Water Gas and Electric Light Company.

Western city, 20,000 people. An experienced man, to have charge of operating and construction department. Answer at once. State experience and salary expected. Good references will be required. Address WATER GAS & ELECTRIC LIGHT,

1007-3 Care this Journal.

GOIN! GOIN!! GOIN!!!

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ALVORD & CO., Mfrs. **Detroit, Mich., U.S.A.**

MOSES G. WILDER,

Mechanical Engineer,

816-822 Cherry St., Phila., Pa.

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Gas Governors,
Governor Gas Burners,
Gas Cocks and Fittings,

In addition to a full assortment of Volumetric Governors, etc., I am now making **MERCURY PRESSURE GOVERNORS** of all the usual sizes, adapted to use upon *Gas Stoves, Furnaces, and Meters.* The same careful attention to details of design and workmanship which has established the reputation of **WILDER'S VOLUMETRIC GOVERNORS** will be given to the new line. They have been thoroughly tested in many places during the past year, and have given entire satisfaction. The price is very low, and but for a complete system of machinery adapted to this work, it would be impossible to sell them at the price. I hope for large orders, as they become known in consequence of the low price and good quality.

Patent Lava Gas Tips.

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ALL SIZES AND SHAPES.

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Utilize Your Gas Liquor.

NO EXTRA LABOR OR OPERATING EXPENSES.

Ammonia Concentrator,

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The Economical Gas Apparatus Construction Co., Ld.

269 Front Street, East, - - Toronto, Canada.

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OF THE

Improved Lowe Water Gas Apparatus

Designed to give the Greatest Efficiency when using any kind of Coal, Anthracite Coal, Gas House or Oven Coke.

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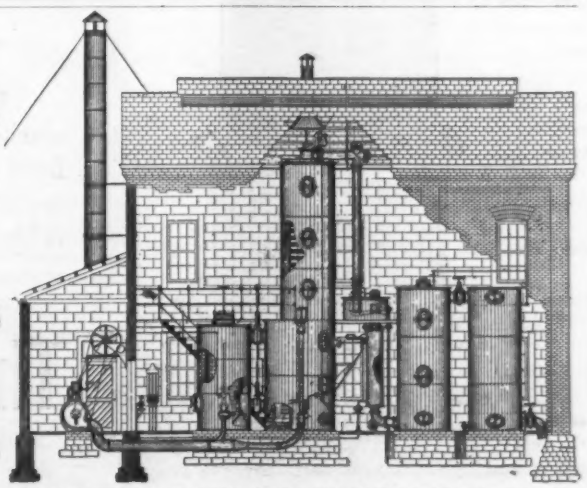

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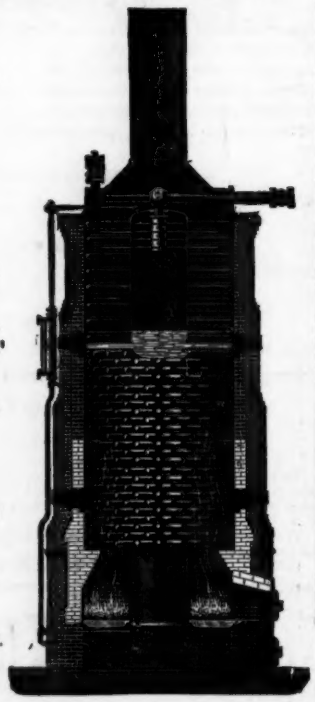

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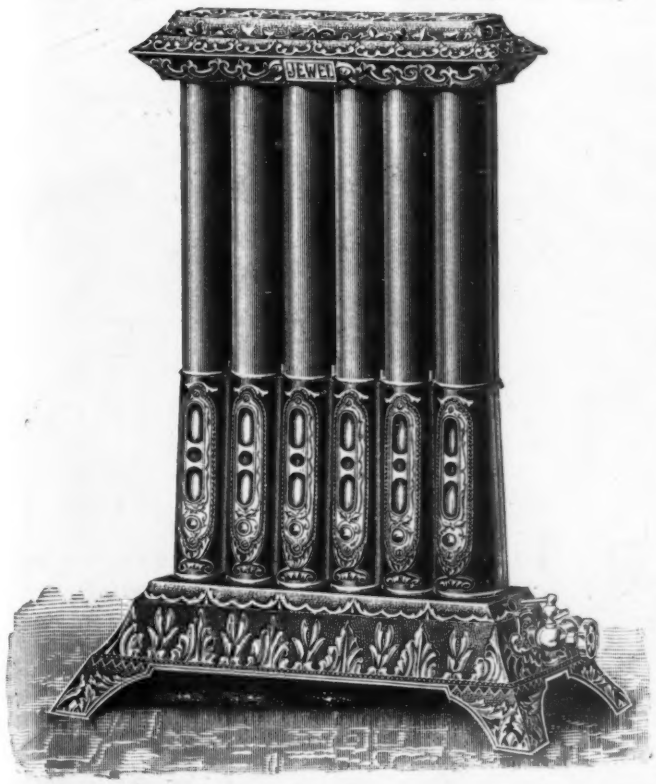

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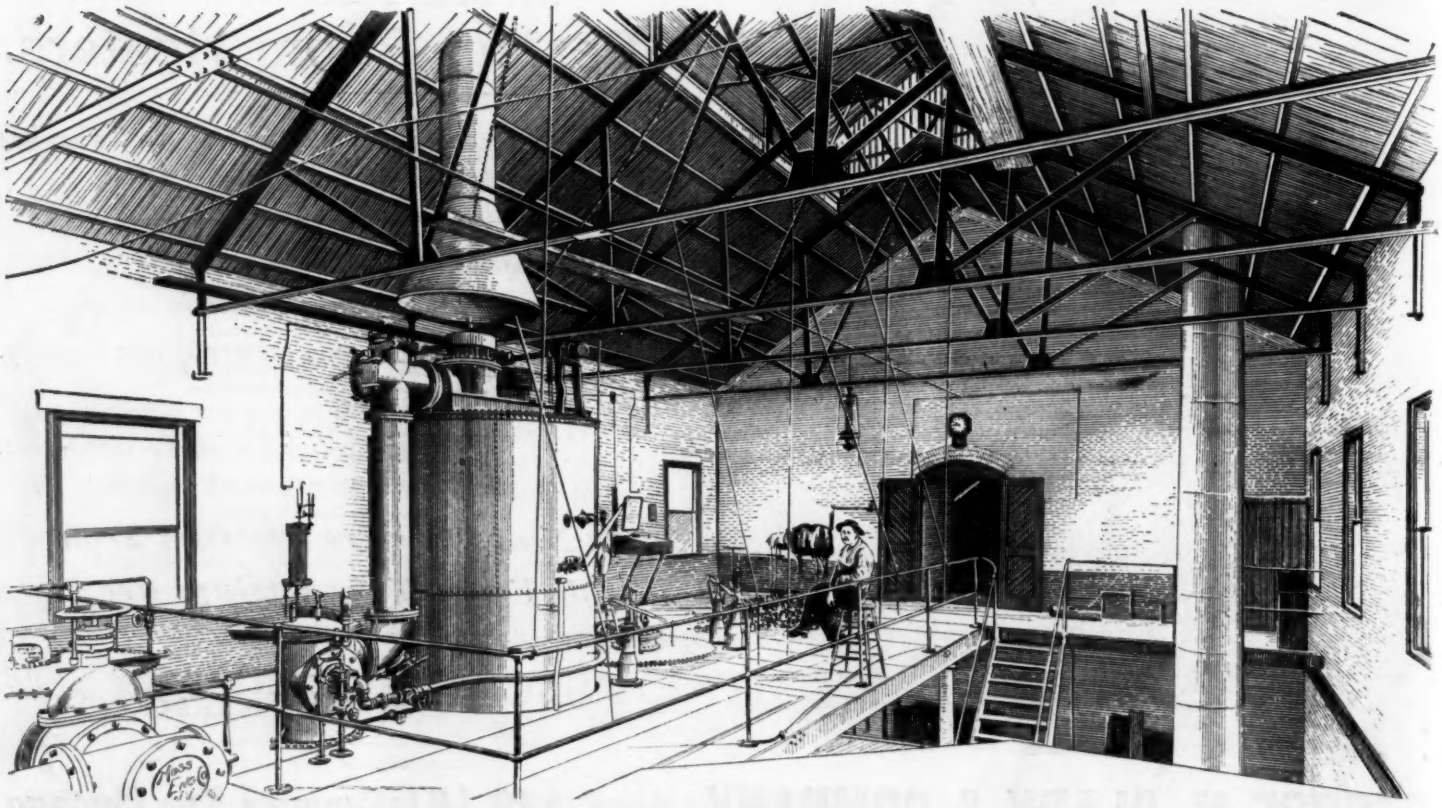

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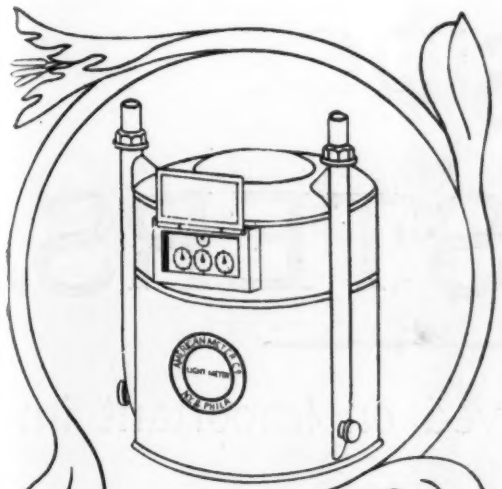

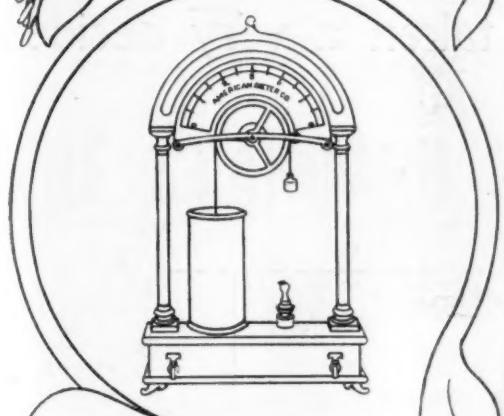

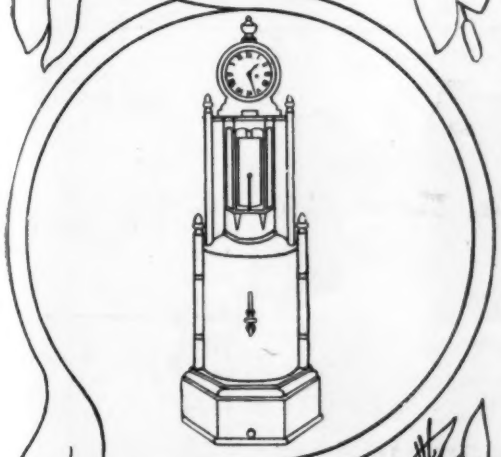

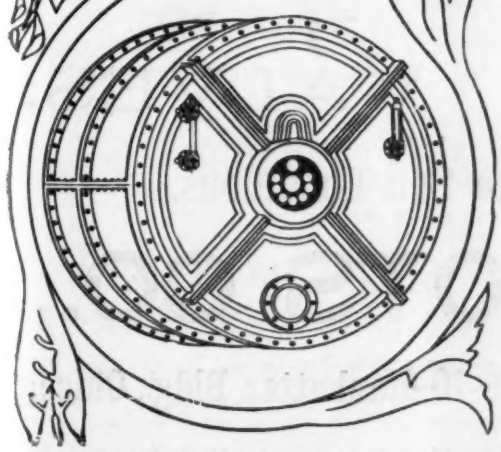

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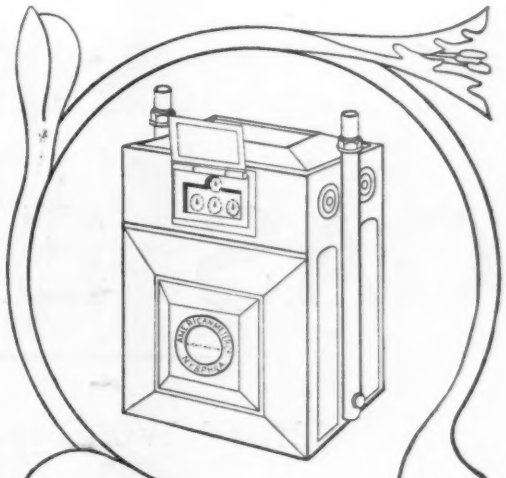
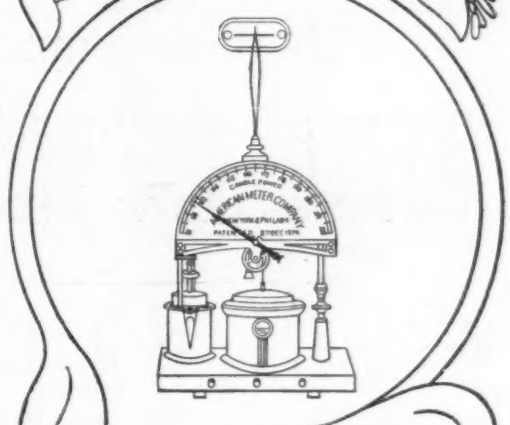
OCTOBER, 1894.

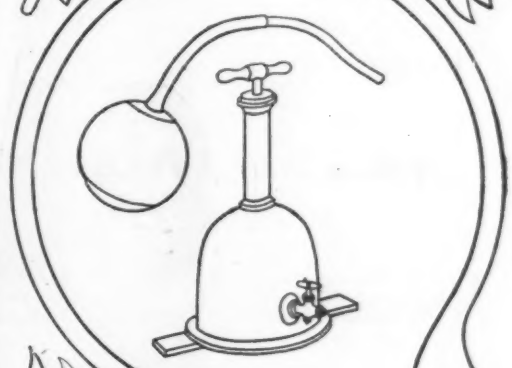
Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Table No. 1. Following the Moon. Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Table No. 2. New York City. All Night Lighting. Extinguish.
				P.M.	A.M.
Mon.	1	6.10 PM	5.00 AM	5.30	5.00
Tue.	2	6.10	5.00	5.30	5.00
Wed.	3	6.10	5.00	5.30	5.00
Thu.	4	7.40	5.00	5.30	5.00
Fri.	5	8.40	5.00	5.30	5.00
Sat.	6	9.30 FQ	5.00	5.30	5.00
Sun.	7	10.30	5.00	5.30	5.00
Mon.	8	11.40	5.00	5.20	5.10
Tue.	9	12.40 AM	5.00	5.20	5.10
Wed.	10	1.40	5.10	5.20	5.10
Thu.	11	2.50	5.10	5.20	5.10
Fri.	12	3.50	5.10	5.20	5.10
Sat.	13	No L.	No L.	5.20	5.10
Sun.	14	No L. FM	No L.	5.20	5.10
Mon.	15	No L.	No L.	5.10	5.20
Tue.	16	5.50 PM	7.10 PM	5.10	5.20
Wed.	17	5.50	7.50	5.10	5.20
Thu.	18	5.50	8.40	5.10	5.20
Fri.	19	5.40	9.40	5.10	5.20
Sat.	20	5.40	10.40	5.10	5.20
Sun.	21	5.40 LQ	12.00	5.10	5.20
Mon.	22	5.40	1.20 AM	5.00	5.30
Tue.	23	5.40	2.30	5.00	5.30
Wed.	24	5.40	3.40	5.00	5.30
Thu.	25	5.40	5.20	5.00	5.30
Fri.	26	5.30	5.20	5.00	5.30
Sat.	27	5.30	5.20	5.00	5.30
Sun.	28	5.30 NM	5.30	5.00	5.30
Mon.	29	5.30	5.30	4.45	5.35
Tue.	30	5.30	5.30	4.45	5.35
Wed.	31	5.30	5.30	4.45	5.35

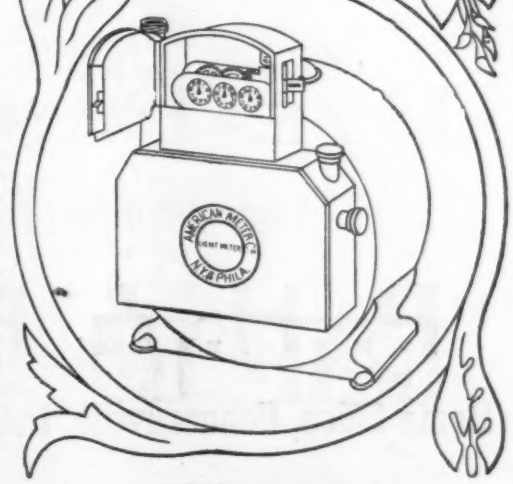
TOTAL HOURS LIGHTING DURING 1894.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January	244.10	January	423.20
February	195.30	February	355.25
March	206.20	March	355.35
April	169.40	April	298.50
May	162.10	May	264.50
June	135.40	June	234.25
July	146.30	July	243.45
August	162.20	August	280.25
September	174.10	September	321.15
October	211.20	October	374.30
November	221.00	November	401.40
December	245.30	December	433.45
Total	2274.20	Total	3987.45









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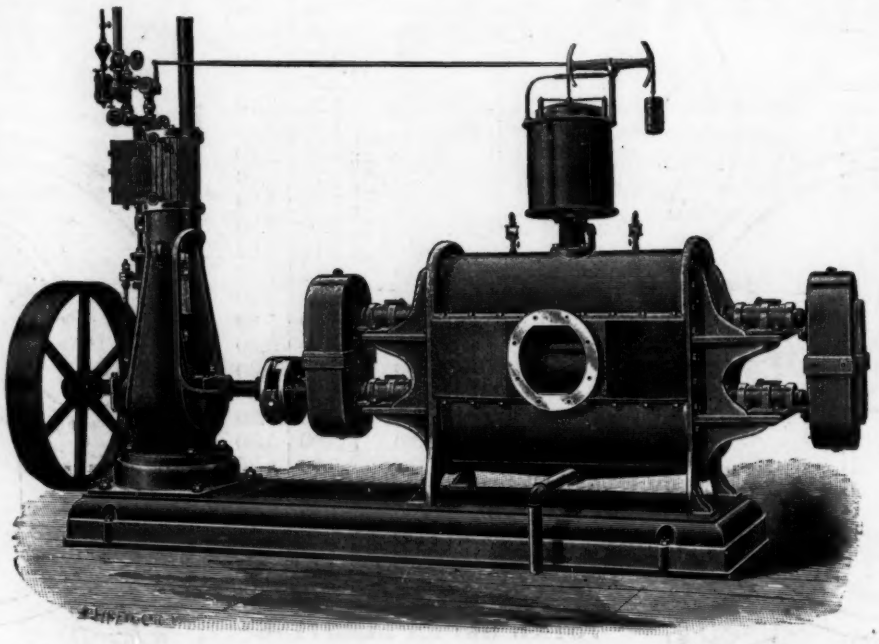

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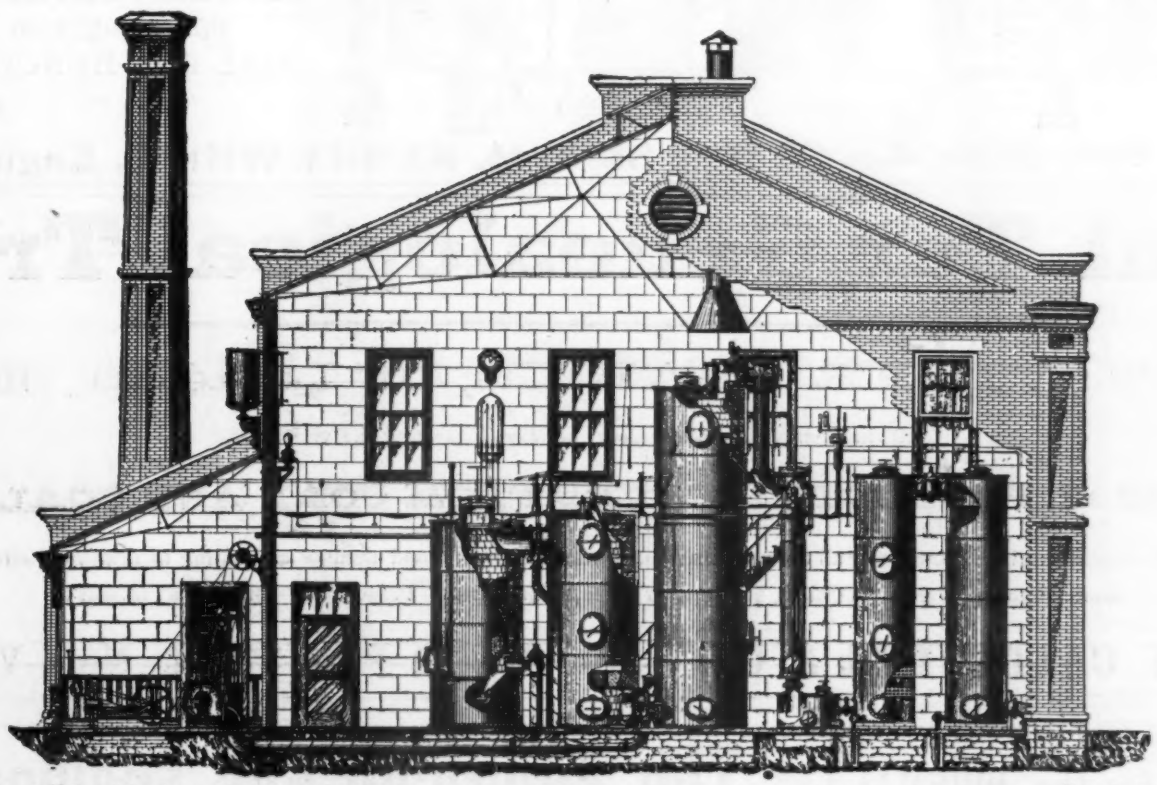

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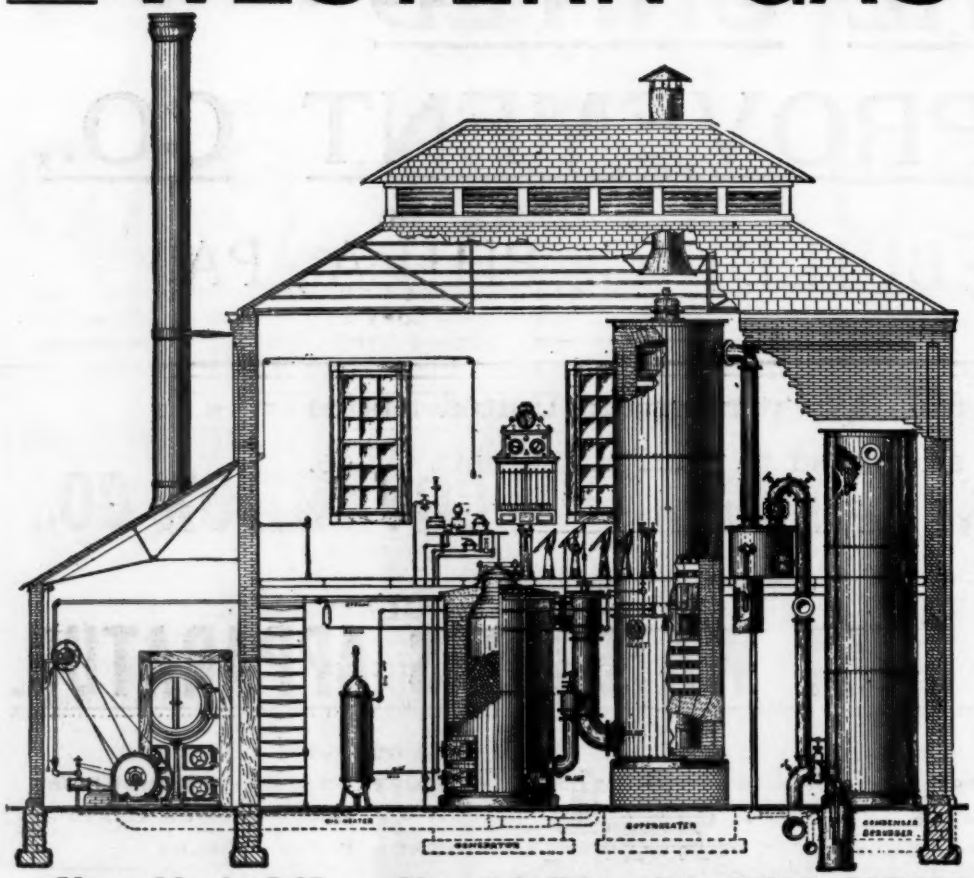

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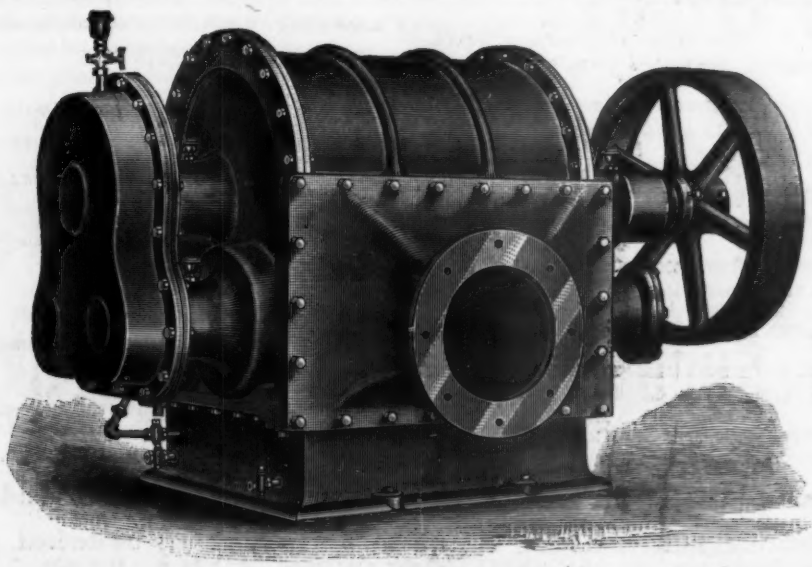

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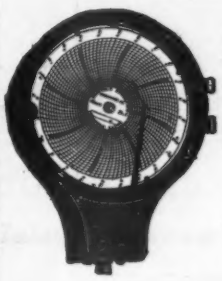

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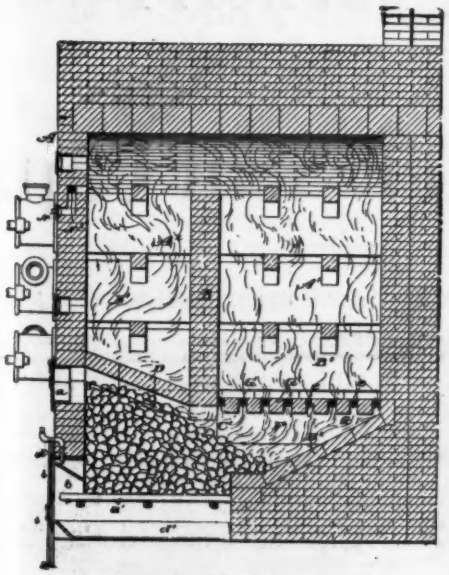

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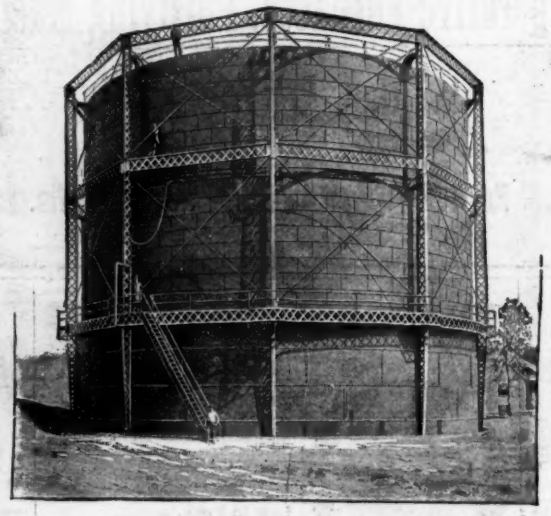

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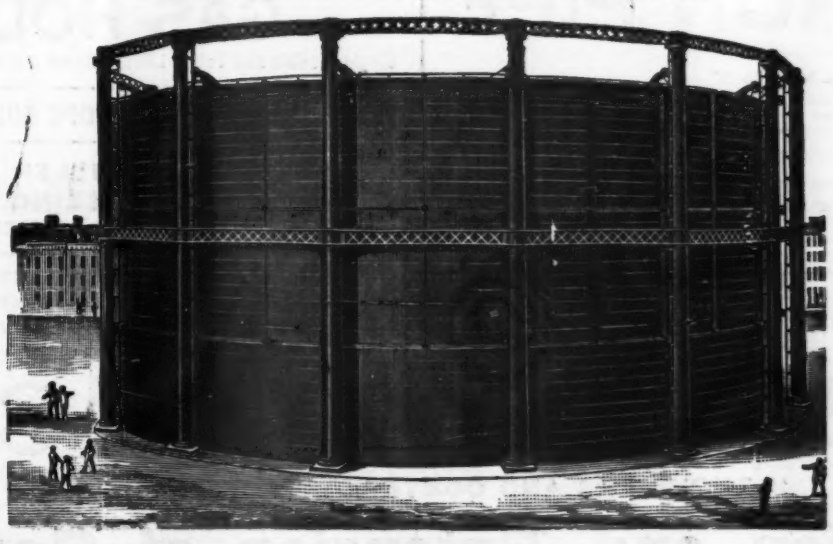

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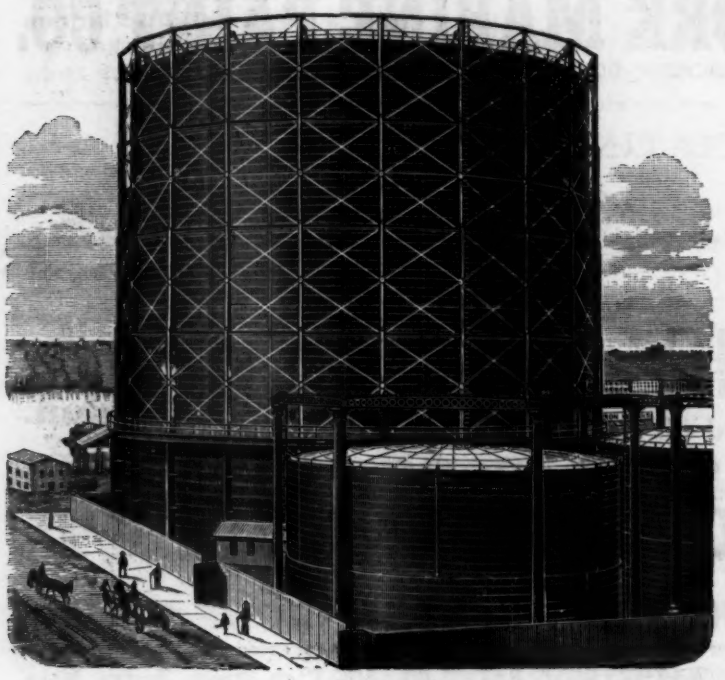

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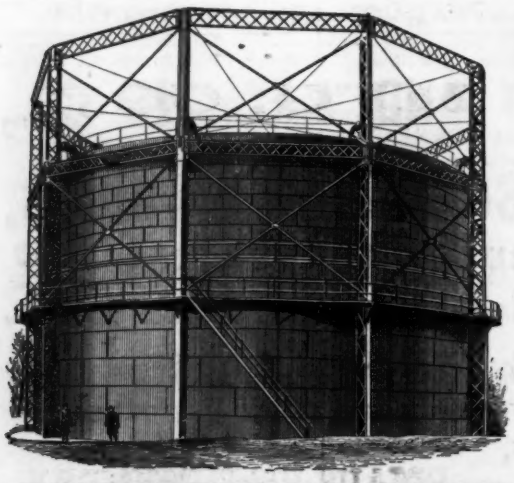

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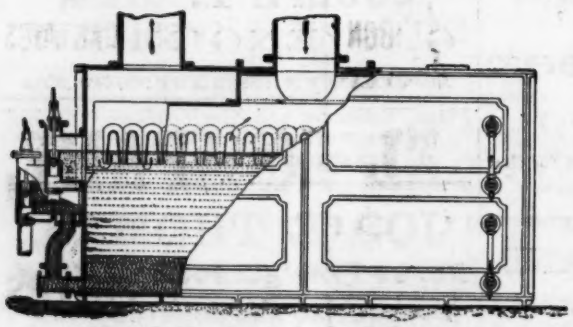

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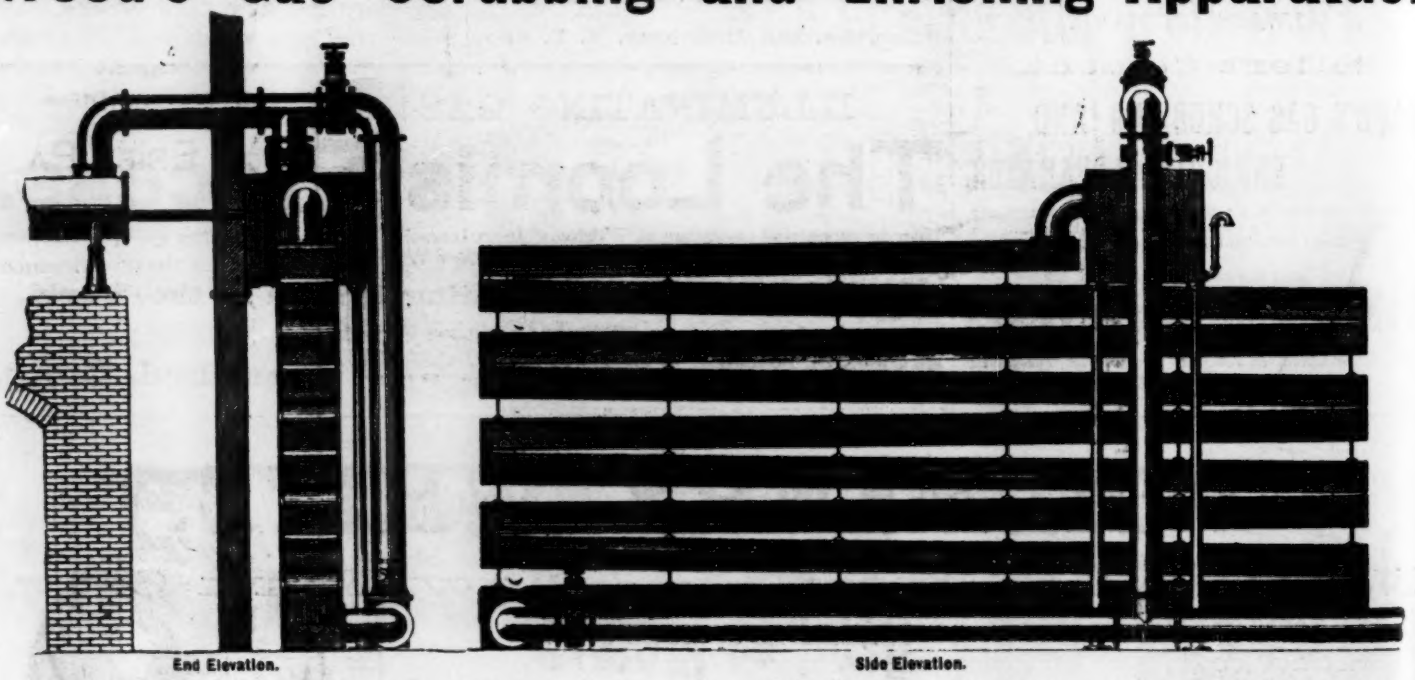

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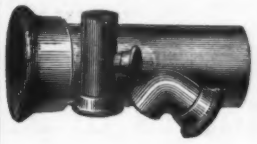

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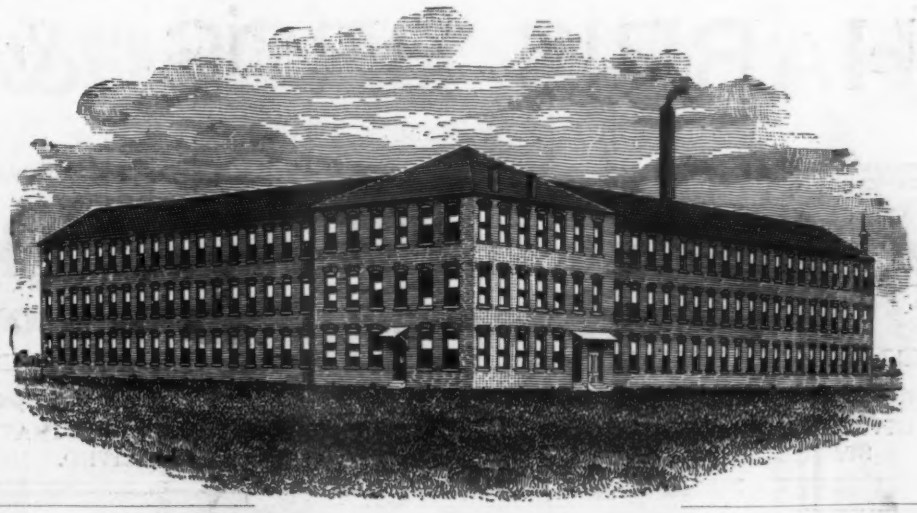

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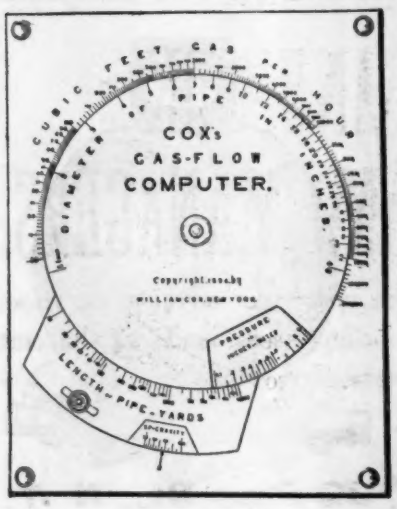

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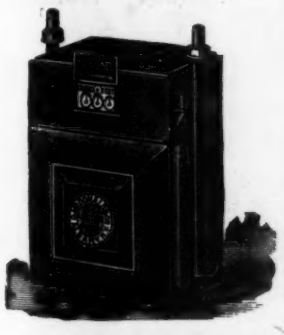

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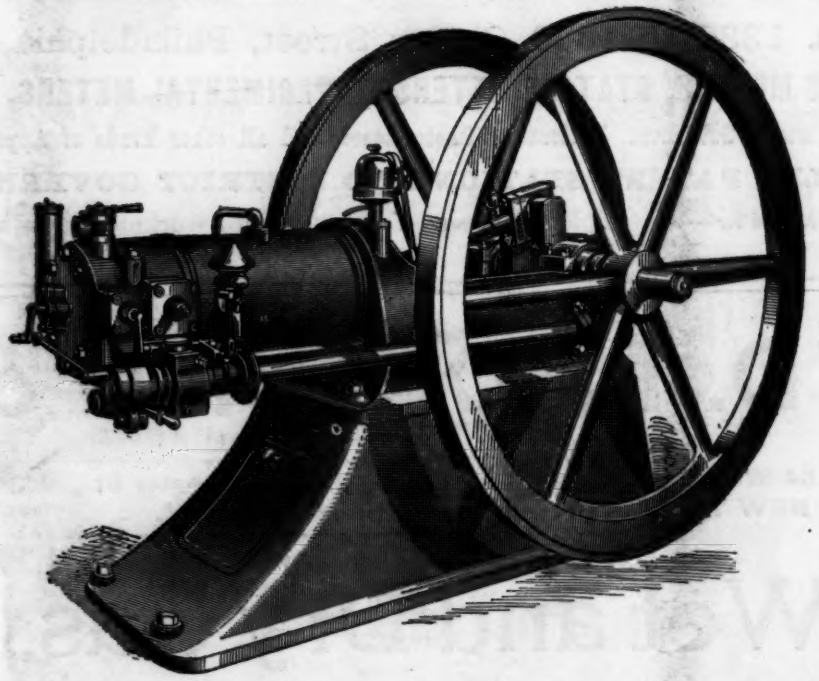

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